RADIO AND TELEVISION SERVICING

1969-1970 MODELS

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RADIO AND TELEVISION SERVICING

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RADIO AND TELEVISION SERVICING
1969–70 MODELS

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RADIO SERVICING DATA (1969-70 MODELS)

PREFACE

THE previous two volumes of Radio and Television Servicing have included an Introduction (1967–68) and a Préface (1968–69). These outlined the changing conditions within the industry and also gave details of the re-arrangement of the sections of the volumes, occasioned by the advent and subsequent establishment of colour television receivers.

The value of such a feature having been substantiated, it has been decided that a Preface will now be a valuable inclusion in this and future volumes.

This year, the Recent Developments Sections has been devoted entirely to a survey of the Mullard Integrated circuits, relating to the domestic circuits produced by the Radio and Television Industry. At present, only the TAD100 has been adopted in any quantity but the industry has been showing great interest in others which are described and also in some which are yet to be generally released.

The Colour Television section includes some "second models", indicating the progress already made in that sphere. Although single-standard colour receivers are not featured, they were presented at the 1969 Radio and Television Shows. The trade was therefore prepared for 15th November 1969, the date when all the B.B.C. and I.T.A. channels were made available on 625-lines, many programmes in colour.

The Radio Servicing section contains, in the B.R.C. section, a guide to semiconductors, a feature which departs from the usual complement. Self-explanatory, the guide features the audio products manufactured by B.R.C. It also serves to emphasize the shortage of semiconductors, forcing the industry to use a wider range of transistors and diodes than it would if it were able to be more selective. The guide also applies to some products featured in the Tape Recorder section.

Logically, as stereo broadcasts have embraced more of the U.K., the amount of stereo equipment featured in the Radio section has increased accordingly. Here (as with the colour television data) stereo servicing information is given in relatively full detail, and such policy will continue until such equipment may be serviced virtually by rote.

The Tape Recorder section again contains enough models to justify the separate existence of the section; it exhibits the constant increase of cassette-type versions.

The Television Servicing (Black and White) section, like its colour counterpart, lacks information on 1969 Trade Show single-standard models. The omission of these is mainly due to the editorial deadline necessary to produce these volumes for publication during a reasonably fixed period. It is confidently expected that many of these models will be featured in the 1970–71 volume.

The section does, however, cover a wide range of dual-standard models, also reflecting the increasing importance of the "Schools" market.

The order of presentation has now also been changed. The monochrome T.V. section, preceded by Tape Recorders, has now been placed before Radios, etc., the latter thus forming the back section of the book. In doing so, problems of administration caused by the expanding earlier sections, have been overcome without adversely affecting the user.

It is interesting to note that the increase of rental business during the last decade has resulted in syllabus changes for examinations offered by the R.T.E.B. Commencing September 1969, the Radio and Television (and Electronics) Servicing examinations are being gradually phased out, and replaced by two new courses. The latter are relevant to the education and training of Technicians and Mechanics respectively.

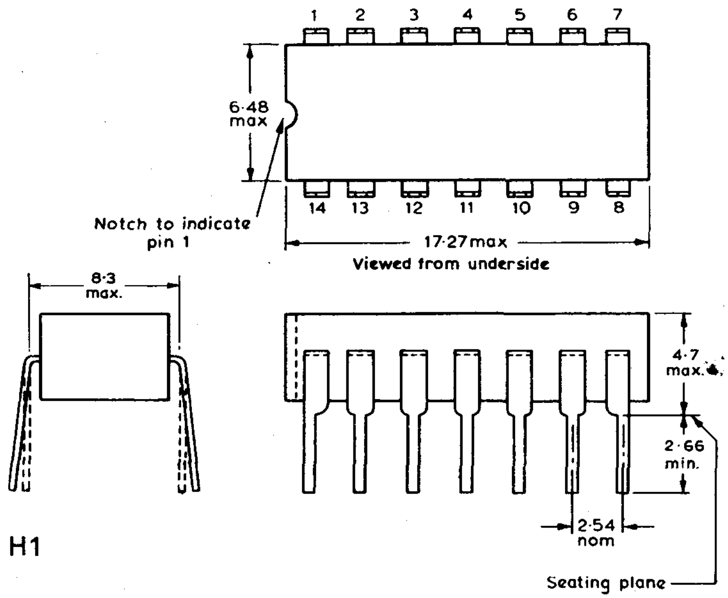
With the continued valuable help received from manufacturers, agents and trade professional bodies, backed by sound technical editorial advice, this volume follows the successful pattern established in the two previous volumes; the increase of pages to its economic limit has been gradual but sufficient to maintain continuity on a wider basis in an increasingly larger area of capacity.

Thus, this volume has maintained the effort to feature a more complete record of the servicing information which is required each year.

J.H.

DEVELOPMENTS IN INTEGRATED CIRCUITS

Many different types of integrated circuit are becoming available to the radio and television industry, and the most recent "Mullard" types are featured in the following pages.

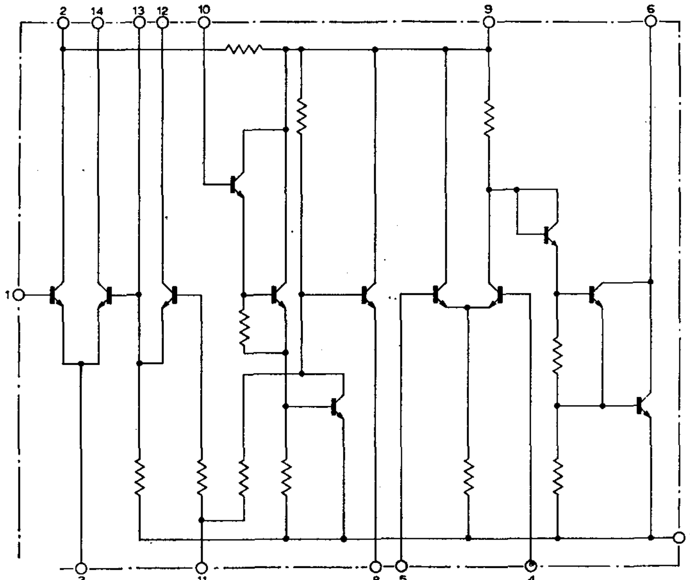


(H1) Outline and Dimensions of TAD100

Mullard TAD100

This is a silicon integrated circuit primarily intented for A.M. receivers. The circuit incorporates the mixer, oscillator, I.F. amplifier, A.G.C. and audio pre-amplifier stages. The audio output transistors are not included so that different output power stages may be added to suit individual receiver requirements. The frequency response of the circuit is such that the front half of the circuit may be used as an I.F. amplifier at 10·7MHz for F.M. receivers.

Devices may be soldered directly into circuits with soldering irons. At iron temperatures below 245°C the maximum soldering time should be less than 10 seconds, and at iron temperatures between 245 and 400°C the soldering time should be less than 5 seconds. In both cases the soldering iron should

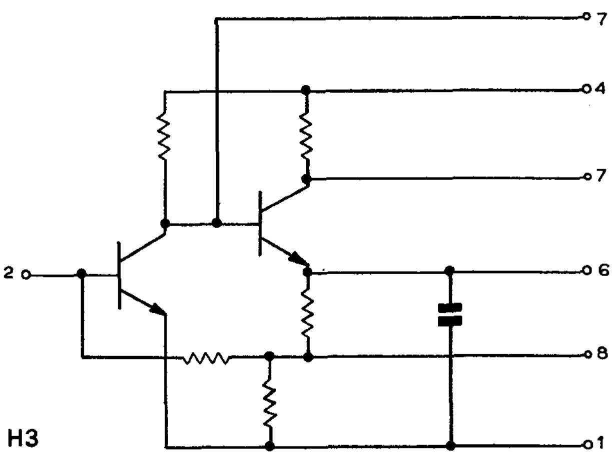


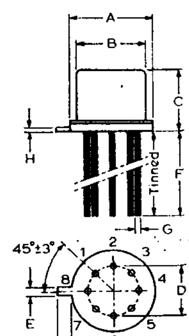
H2

(H2) Equivalent Circuit of TAD100

be applied below the seating plane. Care should be taken not to bend the lead-out tags above the seating plane.

The device should be stored at temperatures between -25 and $+85^\circ$C, and operated at ambient temperatures between -10 and $+55^\circ$C.





H4

H3

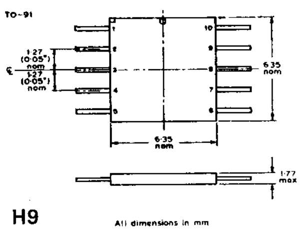
Left: (H3) Equivalent Circuit of TAA231
Right: (H4) Outline and Dimensions of TAA231

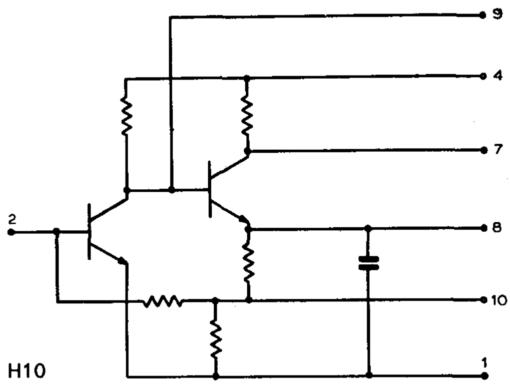
Mullard TAA231

This is a two stage direct coupled wide band amplifier. The large negative feedback provides stable operation over the stated temperature range.

The device should be stored at temperatures between —65 and +175°C, and operated at ambient temperatures between 0 and +75°C.

The nominal values of the dimensions shown in the outline diagram are: A, 8·90 millimetres; B, 8·15 millimetres; C, 4·70 millimetres; D, 5·08 millimetres; E, 0·79 millimetres; G, 0·45 millimetres; H, 0·4 millimetres; J, 0·85 millimetres. Note that the minimum value of F is 38 millimetres.





Left: (H9) Outline and Dimensions of TAA232
Right: (H10) Equivalent Circuit of TAA232

Mullard TAA232

This is a two stage direct coupled wide band amplifier. The large negative feedback provides stable operation over the stated temperature range.

The device should be stored at temperatures between —65 and +175°C, and operated at ambient temperatures between —55 and +125°C.

Mullard TAA241

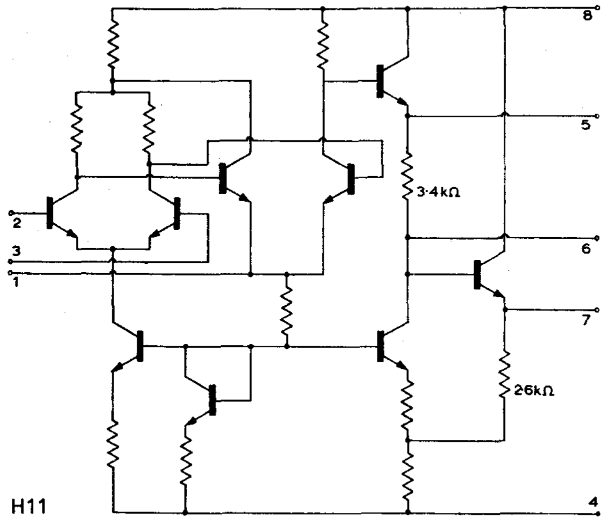
This is an operational amplifier for general purpose applications in instrumentation and control systems.

The outline and dimensions of the TAA241 are similar to those of the TAA231.

Devices may be soldered directly into a circuit with a soldering iron at a maximum temperature of 245°C, for a time of up to 10 seconds at least 1·5 millimetres from the seal. At an iron temperature of 245 to 400°C, the maximum soldering time is 5 seconds at least 5 millimetres from the seal.

Care should be taken not to bend the leads nearer than 1·5 millimetres from the seal.

The device should be stored at temperatures between —65 and +150°C, and operated at ambient temperatures between 0 and +70°C.



H11

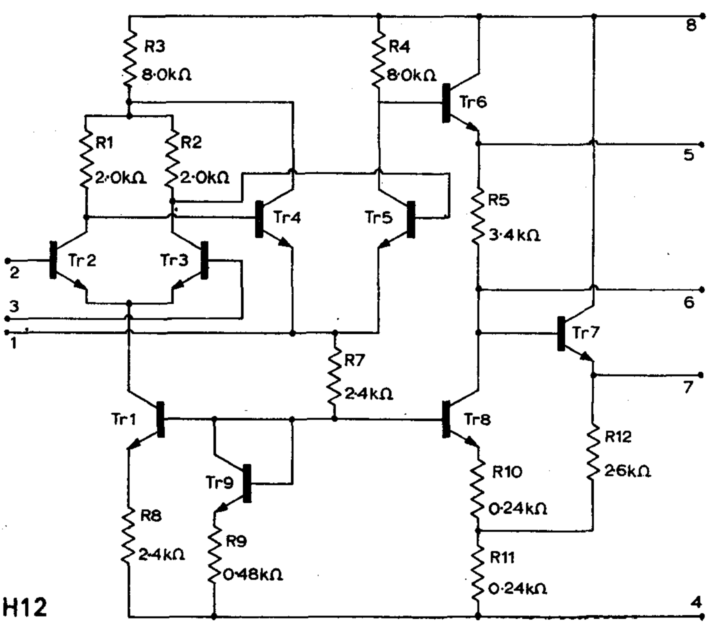
(H11) Equivalent Circuit of TAA241

Mullard TAA243

This is an operational amplifier for general purpose applications in instrumentation and control systems.

Outline and dimensions of TAA243 are similar to those of TAA231.

The device should be stored at temperatures between −65 and +150°C, and operated at ambient temperatures between −25 and +100°C.

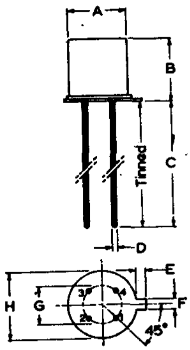


(H12) Equivalent Circuit of TAA243

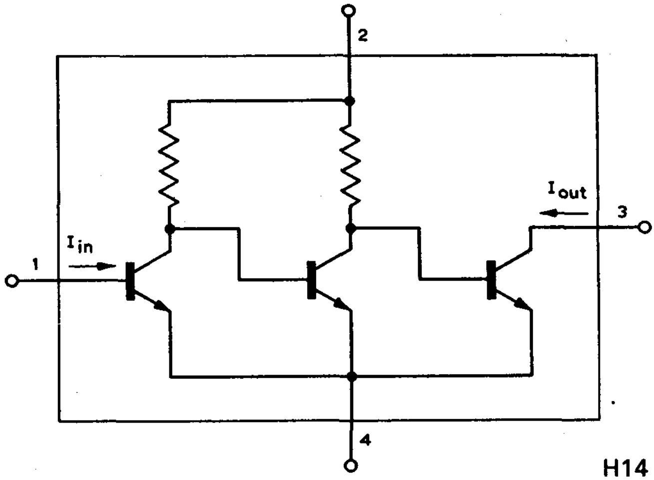
H12

Mullard TAA263

This is a semiconductor linear integrated A.F. amplifier in a TO-72 envelope. It comprises a three-stage direct coupled low-level amplifier for use from D.C to 600 KHz.



H13



H14

Left: (H13) Outline and Dimensions of TAA263
Right: (H14) Equivalent Circuit of TAA263

The values of the dimensions shown in the outline diagram are: A, 4·8 millimetres max.; B, 5·3 millimetres nom.; C, 12·7 millimetres min.; D, 0·43 millimetres nom.; E, 1·0 millimetres nom.; F, 1·05 millimetres nom.; G, 2·54 millimetres nom.; H, 5·5 millimetres nom.

The device should be stored at temperatures between −65 and +100° C, and operated at ambient temperatures between −20 and +100° C.

Mullard TAA293

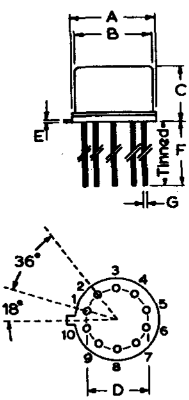
This is a general purpose medium frequency amplifier. In order to ensure maximum flexibility a number of the internal elements are brought out to individual external connectors, thus enabling many different circuit configurations to be used.

The values of the dimensions shown in the outline diagram are: A, 8·90 millimetres nom.; B, 8·15 millimetres nom.; C, 5·33 millimetres max.; D, 5.08 millimetres nom.; E, 0.40 millimeters nom.; F, 21 millimetres max.; G, 0·43 millimetres nom. The envelope is isolated and the 10 pins are spaced equally on 360 degrees.

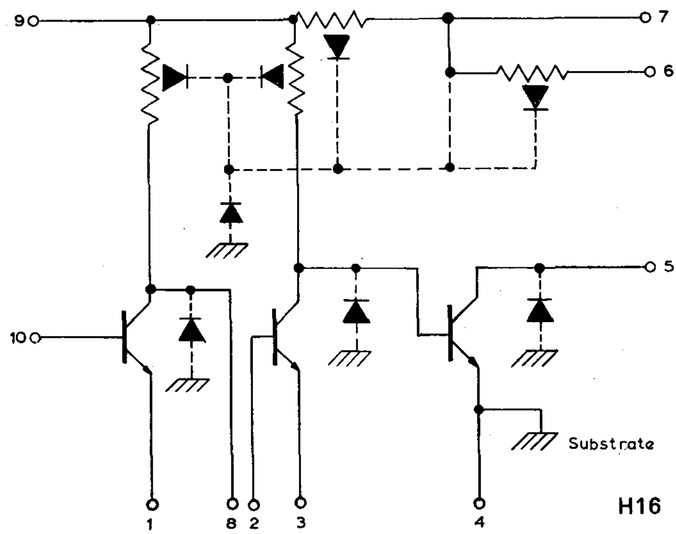
The diodes, shown dotted in the equivalent circuit diagram, represent the internal diode connections to the substrate, therefore, the circuit potentials should be arranged so that these diodes are always reverse biased.

The soldering and wiring recommendations for the TAA293 are similar to those given for the TAA241.

The device should be stored at temperatures between −25 and +100°C, and operated at ambient temperatures below 70° C.



H15



H16

Left: (H15) Outline and Dimensions of TAA293
Right: (H16) Equivalent Circuit of TAA293

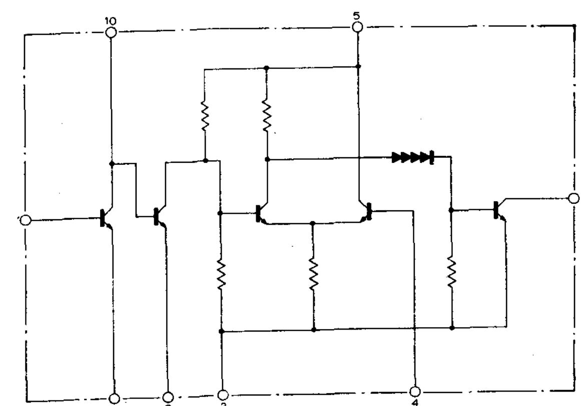
Mullard TAA310

This is a monolithic low noise audio pre-amplifier primarily intended for use as a record and play-back amplifier for tape recorders.

The outline and dimensions of the TAA310 are similar to those of the TAA293, but the envelope is not isolated. Note that pins 3, 4, 5 and 10 must never have a negative potential applied with respect to pin 2 (substrate).

The device should be stored at temperatures between −20 and +80° C, and operated at ambient temperatures between −20 and +75° C.

(H17) Equivalent Circuit of TAA310



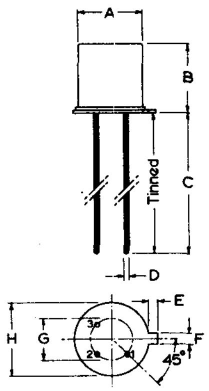
H17

Mullard TAA320

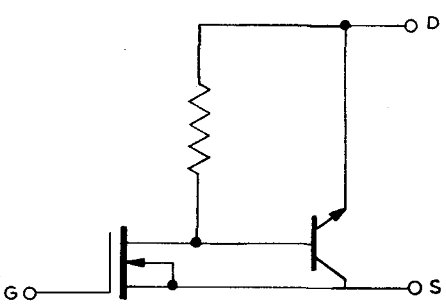
This is a circuit consisting of an M.O.S.T. input stage followed by a bi-polar transistor amplifier stage. Thus, the TAA320 has a very high input resistance and a low transconductance, which makes the device particularly suitable as a direct driver in audio amplifiers for use with crystal pick-ups.

The values of the dimensions in the outline diagram are: A, 4·8 millimetres max.; B, 5·33 millimetres max.; C, 12·7 millimetres min.; D, 0·43 millimetres nom.; E, 1·0 millimetres nom.; F, 1·05 millimetres nom.; G, 2·54 millimetres nom.; H, 5·55 millimetres nom.

Pins: drain; 2, gate; 3, source connected to case.



H18



H19

Left: (H18) Outline and Dimensions of TAA320
Right: (H19) Equivalent Circuit of TAA320

When using a soldering iron, devices may be soldered directly into the circuit, but heat conducted to the junction should, if possible, be kept to a minimum by the use of a thermal shunt. Care should be taken not to bend the leads nearer than 1·5 millimetres from the seal.

The device should be stored at temperatures between −65 and +125°C, and operated at ambient temperatures below +125° C.

Acknowledgement

Further technical information may be obtained from Mullard Limited, Mullard House, Torrington Place, London W.C.1, whom we wish to thank for providing the basic information and granting permission to make use of their tentative data sheets.

COLOUR TELEVISION SERVICING

ACKNOWLEDGEMENTS

British Radio Corporation Ltd.
Decca Radio and Television
Dynatron Radio Ltd.
Radio and Allied (Holdings) Ltd.
Radio Rentals Ltd.
R.T.S. Ltd.

BAIRD 700 Series

General Description: This series of dual-standard colour television receivers is described in the 1967–68 and 1968–69 volumes. Here, information is given from the modifications supplement to the service manual, and some of the material in the earlier volumes has been brought up to date.

700 Series Service Manual—*Errors (due to incorrect original information):*

1. *See 1968–69 volume*, modification 18. C260 should be 68 pF not 680 pF.
2. *See 1967–68 volume*, Fig. H223 on page 55. H.T. +1 near R420 should read H.T. +2.

Delay Line:

1. The delay line now used is the Mullard DL1E and not the Mullard DL1.
2. R270 is now 560 ohms and not 150 ohms.
3. R276 is now 82 ohms and not 47 ohms.
4. R278, R279, R280, R281, R284 and R285 are now 820 ohms and not 270 ohms.
5. R296 is now 18 ohms and not 39 ohms.
6. R297 is now 18 ohms and not 39 ohms.
7. C244 is now deleted.
8. C252 is now 820 pF and not 560 pF.

7·8 kHz Switch Generator:

1. A single-ended PAL switch is now used instead of a double-ended one.
2. R244 is now 47k and not 33k.
3. R252, R253, R254 and R255 are now deleted.
4. R256 is now 27k and not 6·8k.
5. R257 is now 220k and not 15k.
6. R258 is now deleted and replaced by D29.
7. R259 is now a link and not 1·2k.
8. R266 is now 10k. and not 3·9k.
9. R267 is now 1k and not 3·9k.
10. R282 is now deleted.
11. R283 is now deleted.
12. C235 is now 12·5 μF and not 25 μF.
13. C236 is now deleted.
14. C238 is now 1200 pF and not 25 μF.
15. C241, C242 and C256 are now deleted.
16. C257 is now 220 pF and not 0·1 μF.
17. D27 is still an OA90 but its polarity has been reversed.
18. D29 is still an OA90 but it has been moved to a new position.
19. Tr25 is now deleted.
20. L216B is now deleted.
21. TP19 is now connected to the collector of Tr24.

A.P.C. Loop:

1. The circuit of the D.C. amplifier Tr22 has been altered and simplified.
2. R215 and R216 are now deleted.
3. R219 is now a link and not 47k.
4. R223 is now a link and not 560 ohms.
5. R225 is now a link and not IM pot.
6. R227 is now a link and not 18k.
7. C202 is now deleted.
8. C204 is now 220pF and not 1000pF.
9. C212 is now deleted.
10. C212 is now deleted.
10. C213 is still 0·1 μF but it is now connected to the collector of Tr22.
11. C218 (220pF) has been added to circuit.
12. L202 is now deleted.

Crystal Oscillator:

1. R231 (15k) has been restored to its original position between the base of Tr23 and the junction of L206, C221, C217 and R232.

2. When R231 is connected between the base and collector of Tr23, squegging tends to occur with low activity crystals.

First Chrominance Amplifier:

1. R303 is now 3·9k and not 4·7k.

2. R303 has been reduced in value to ensure that Tr27 is always cut off when the saturation control R302 is at its minimum setting.

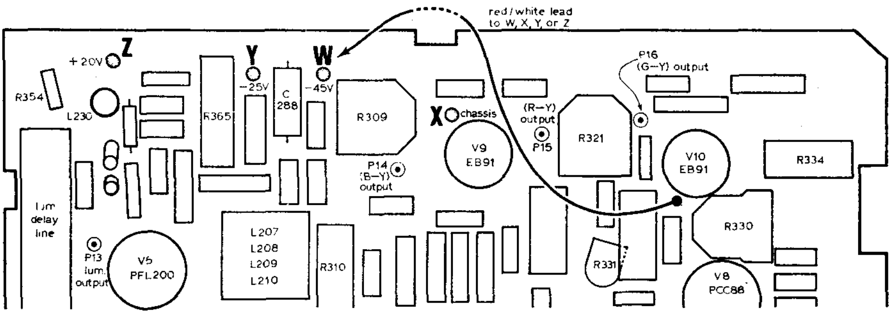
Line Blanking:

1. R241 is now a link and not 180 ohms.
2. R332 is now a link and not 15k.
3. R343 (100k) has been added to circuit.
4. C229 is now deleted.
5. C293 (0·1 μF) has been added to circuit.
6. V10b (half EB91), formerly unused, is now employed as D.C. restorer.

—45 V Line (Tap W):

1. A circuit is now included on the decoder panel to provide a —45 V line to which the D.C. restorer V10b may be connected if required.
2. R330 is now 20k pot. and not 10k pot.
3. R332 is now 10k and not 15k, and it has been moved in position.
4. R333 (100k) has been added to the circuit.
5. R334 is now 2·7k and not 2·2k.
6. C287 (0·1 μF) has been added to circuit.
7. C288 (0·1 μF) has been added to circuit.
8. D45 (OA91) has been added to circuit.
9. There are now four points to which the red/white flying lead, at the top of the decoder panel, may be connected. W (—45 V), X (chassis), Y (—25 V)

and Z (+20 V). The correct tap is the one which requires the brightness control to be near maximum on a normal picture when the three background controls are also near to their maximum settings. The receiver should be switched off before the red/white lead is moved. It should be noted that the X tap has been moved in position.



(H20) The Four Taps at the Top of the Decoder Panel (Baird 700 Series)

Transistors:

1. A number of transistors have been changed to epoxy encapsulated types.
2. Tr20, Tr27 and Tr28 are now BF194.
3. Tr21, Tr23 and Tr24 and now BC147.
4. Tr22, Tr26 and Tr30 are now BC148.

Inductors:

1. L205, L220 and L221 are no longer fitted with screening cans.
2. L205, L220 and L221 now have the same specification as L219.

Pin-cushion Correction:

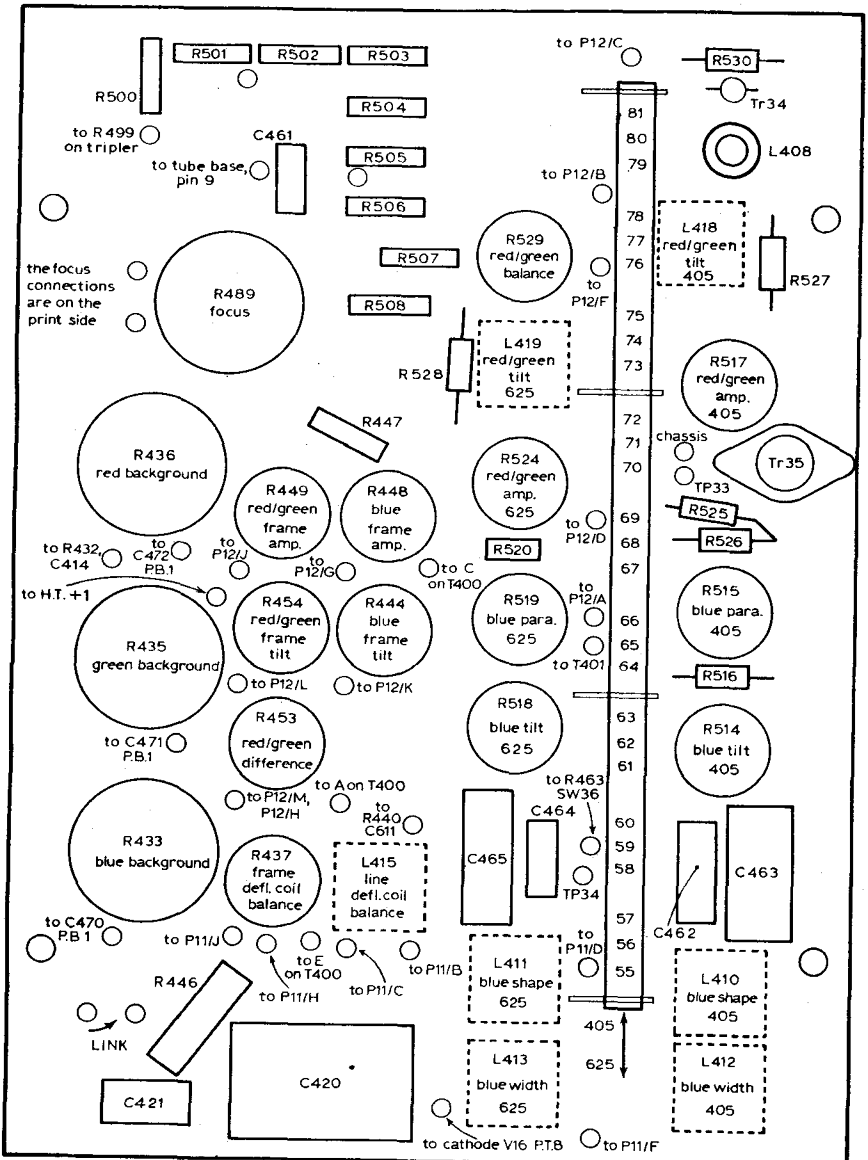
1. R442 is now deleted, and R443 (3·3 k) has been added to circuit.

Field Convergence Circuit:

1. The field convergence section has been replaced by a matrix circuit which gives better overall results.
2. R444 is now 300 ohms pot. and not 50 ohms pot.
3. R445 is now deleted.
4. R448 is now 100 ohms pot. and not 50 ohms pot.
5. R449 is now 100 ohms pot. and not 50 ohms pot.
6. R450 is now deleted.
7. R453 is now 300 ohms pot. and not 50 ohms pot.
8. R454 is now 300 ohms pot. and not 50 ohms pot.
9. C422 is now deleted.

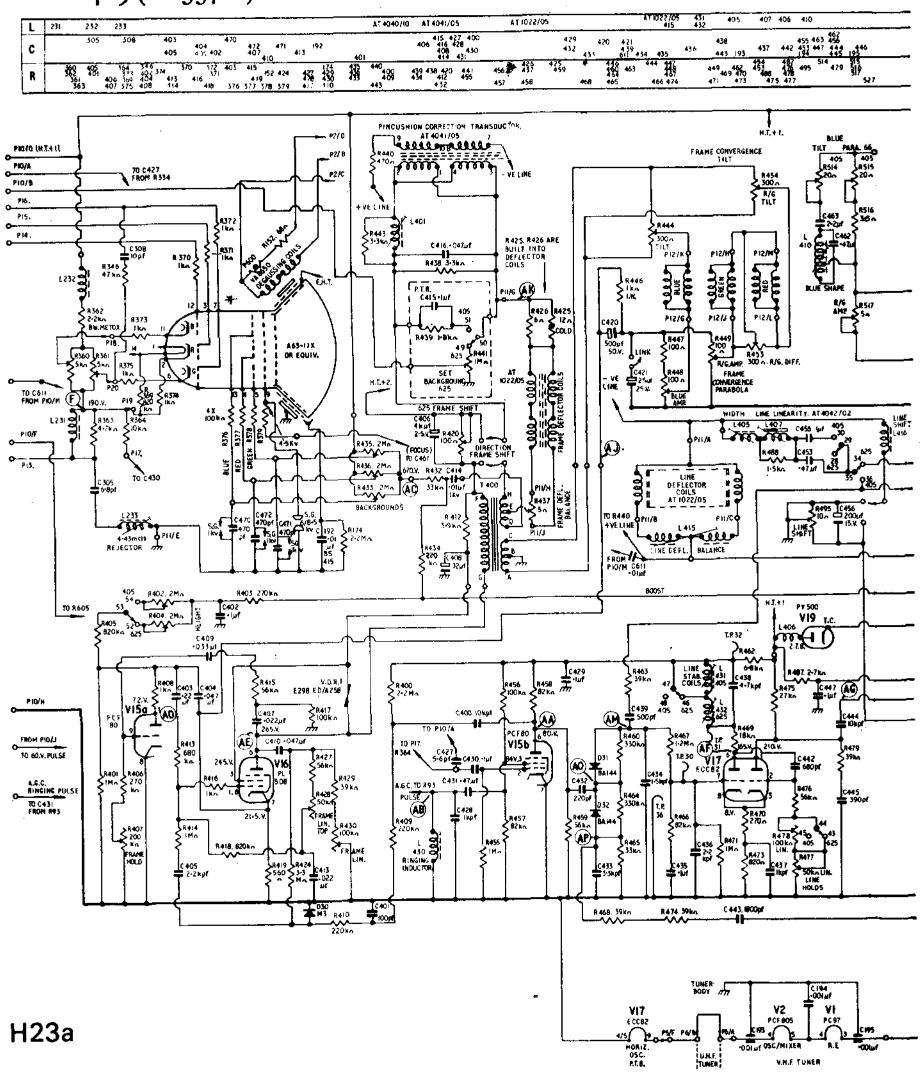
Field Timebase

1. The new field convergence circuit loads the field timebase less than the former circuit, therefore the timebase circuit has been altered to restore the original conditions of scan.



(H21) Component Locations—New Convergence Panel (Baird 700 Series)

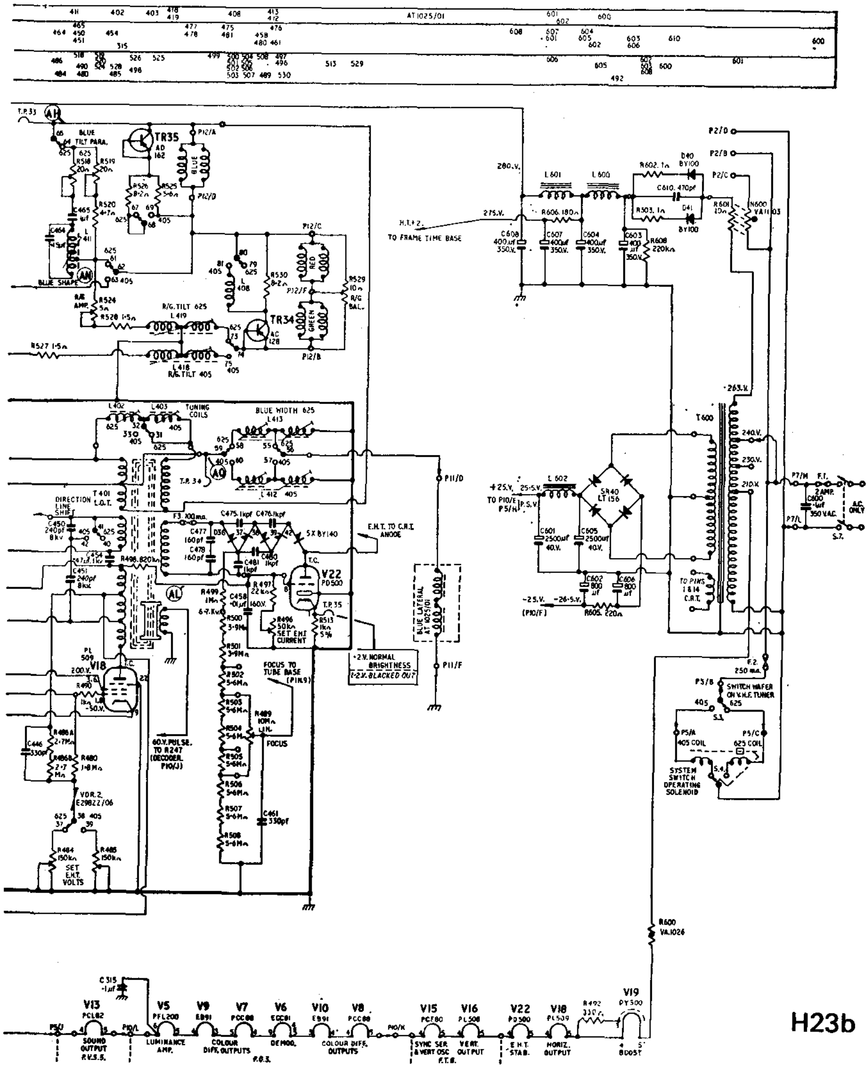
2. R406 is now 270k and not 150k.
3. R413 is now 680k and not 560k.
4. R415 is still 56k but its type has been changed from Erie 8AP to Erie 9.
5. R417 (100k) has been added to circuit.
6. C403 is now 0·22 μF and not 0·1 μF.
7. C407 is now 0·22 μF and not 0·1 μF.
8. C409 (0·033 μF) has been added to circuit.



(H23a) Circuit Diagram—Timebase, C.R.T., Convergence and Power Supply Sections (Including Modifications) (Baird 700 Series) (Part)

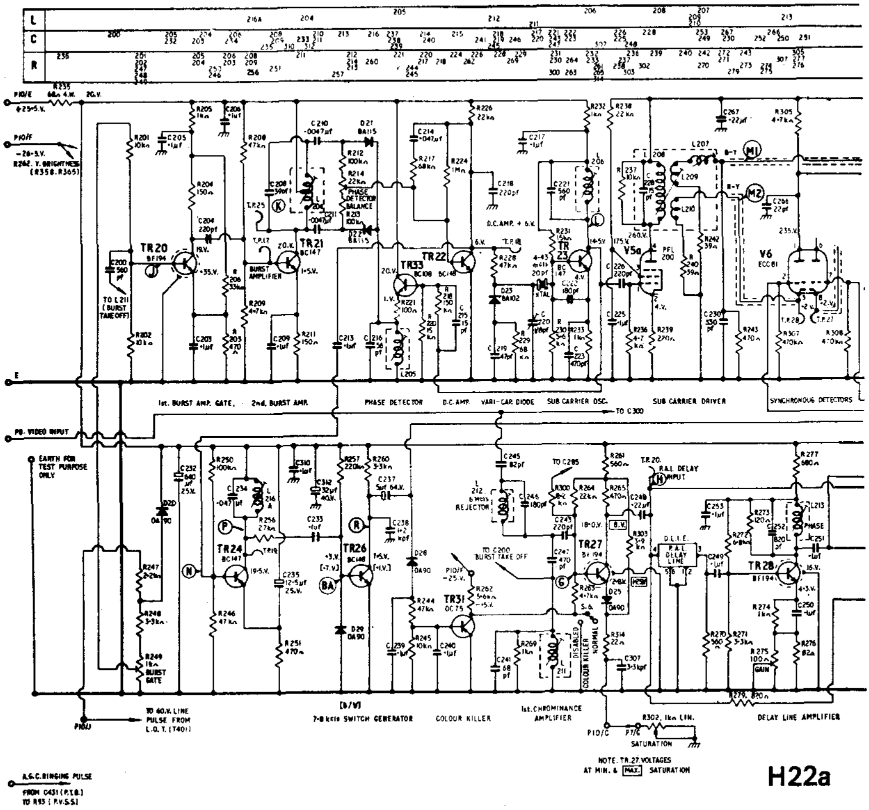
Adjustments (Pin-cushion Correction):

1. Adjust the background controls to give a blue raster, and adjust the pin-cushion correction inductor L401 (it is situated on the power supply panel) until the scanning lines at the top and bottom of the picture are straight, with neither pin-cushion nor barrel distortion. Adjust the background controls to restore a black-and-white picture. Check that the brightness control R356



H23b

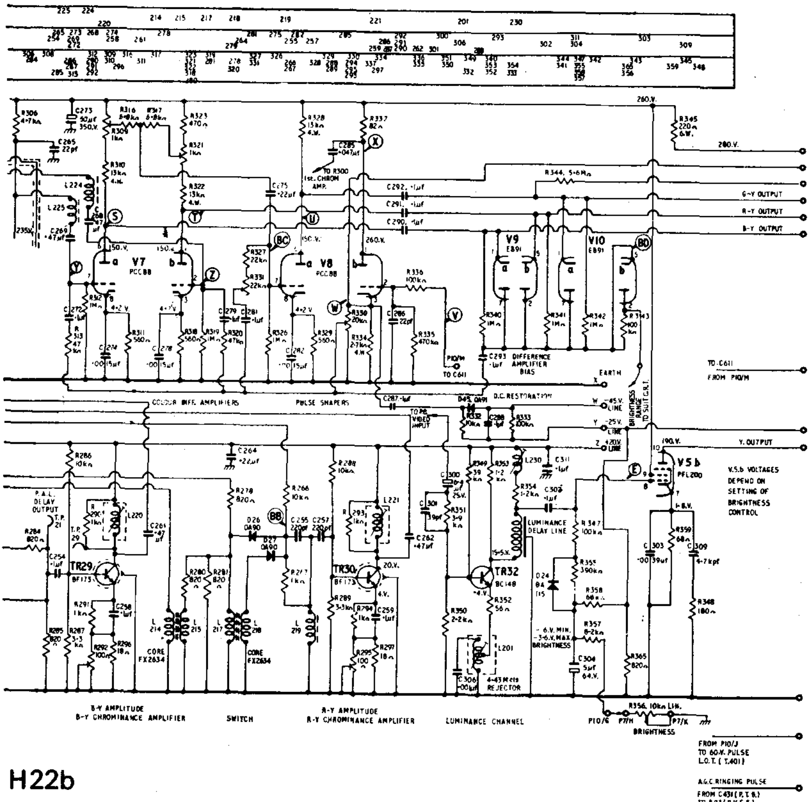
(H23b) Circuit Diagram—Timebase, C.R.T., Convergence and Power Supply Sections (Including Modifications) (Baird 700 Series) (Continued)



(H22a) Circuit Diagram—Modified Decoder (Baird 700 Series) (Part)

has to be set near to its maximum setting on a normal picture when the background controls are near their normal settings. If this is not so, the red/white flying lead at the top of the decoder panel must be moved to W, X, Y or Z, as appropriate, so that a satisfactory range of adjustment is obtained on the brightness control (switch the set off before moving the lead).

2. Remove both aerial leads and tune the receiver to a U.H.F. channel well away from the channels in use in the area. Inject a 625-line convergence-grid signal into the U.H.F. aerial socket. Adjust the three background controls so that they are all near their maximum positions (towards the clockwise ends of their travels). Adjust the contrast and brightness controls until the convergence grid is visible on the screen and then adjust the focus of the receiver (and the tuning if necessary) until the lines of the grid are as sharp as possible.



H22b

(H22b) Circuit Diagram—Modified Decoder (Baird 700 Series) (Continued)

Adjustments (Setting of Dynamic Convergence Controls):

1. The convergence controls should be set as described below.

	red/green field amp	fully anticlockwise
	red/green field tilt	central
	red/green field difference	do not adjust
	blue field amp	fully anticlockwise
	blue field tilt	central
	field deflection coil balance	do not adjust
	red/green line balance	central
	line deflection coil balance	do not adjust
405 and 625	blue parabola, blue tilt, blue shape, blue width	do not adjust

The following adjustments are made both to the 625-line controls (on the left of the system switch) and to the 405-line controls (on the right of the system switch):

405 and 625	red/green tilt	core to be central between the two
	red/green amp	coils fully anticlockwise

2. The degaussing coil should now be employed to demagnetise the shadow mask of the C.R.T. Switch the coil on and move it over the front, top and sides of the receiver (but not over the rear) and finish with the coil parallel with the front of the C.R.T. and a few inches in front of it. Withdraw it directly from the receiver to a distance of at least 8 ft and turn it vertically through 90 degrees to minimise the field produced at the receiver. Then switch it off.

3. It is now necessary to adjust the red, green and blue static magnets. When turning the red static magnet, care should be taken not to let the hand approach any parts on the convergence panel, since some of them are at high potentials. Turn each of the three magnets through 360 degrees while looking at the screen. This will establish the range of adjustment available for each colour. Then, set each magnet to the mid-point of its range. Reduce the setting of the blue background control to zero (fully anticlockwise) and then alter the red and green static magnets until the red and green lines at the centre of the screen are coincident to form yellow lines. Turn up the blue background control to maximum. If the blue grid is much fainter than the yellow grid, reduce the settings of both the red and green background controls (and vice versa). Adjust the blue static magnet so as to bring the blue horizontal lines at the centre of the screen into coincidence with the yellow horizontal lines. Then adjust the blue lateral magnet to converge the blue vertical lines with the yellow vertical lines at the centre of the screen. It may be necessary to repeat the procedure for red and green after adjusting blue.

4. The adjustments for purity are best performed while standing at the rear of the receiver, looking over the top into a mirror. Switch the convergence generator to give a blank raster and set the blue and green background controls to minimum. Set the contrast and brightness controls for a red screen of medium brightness. Undo the wing-nuts of the deflection coils and move them as far towards the base panel of the C.R.T. as they will go. To give a starting point, the purity magnets should be turned to their neutral position by rotating one relative to the other until both notches are together. The screen will show coloured patches, one of which will be red and probably not too far from the centre of the screen. The purity magnets should now be adjusted by rotating one relative to the other to increase the magnetic effect (maximum effect being when the notches are 180 degrees apart) and by rotating the two together round the neck of the C.R.T. They should be adjusted to make the red patch as large as possible and as near the centre of the screen as can be managed. The deflection coils may now be moved nearer the screen of the C.R.T. until the whole screen is red. The red background control should now be turned down and the green control turned up. The screen should be uniformly green. A similar procedure is followed with the blue control. If one or more of the colours gives

an impure raster, the purity magnets and the position of the deflection coils should be altered until all three coloured rasters are pure when assessed individually. The deflection coils should then be locked in position. When optimum results have been obtained, a magnifying lens should be used to check the landings of the three beams in turn upon their respective phosphor dots—the landings should be perfect in the central area of the tube. It may be found that the purity is not perfect and seems to vary cyclically, in sympathy with the beat frequency between the mains supply and field frequency of the transmissions. The changes in purity occur when the thermistor N600 is defective, or when it is more than $\frac{1}{4}$in. away from resistor R601 (which heats it when the set is in use). If the settings of the purity magnets have been altered, the picture shift controls will need re-adjustment, but this can be carried out at stage 6 below.

5. Switch the convergence generator to provide a grid and re-adjust the four static convergence magnets as previously described until the centre convergence is perfect. It is important that the static convergence should be correct on both 405 and 625.

6. Turn down the red and blue background controls so that a green grid remains on the screen. Disconnect the convergence generator from the receiver and plug in V.H.F. and U.H.F. aerials (test-card transmissions being required on 405 and 625). Check that the field and line shift controls are correctly adjusted. It is most important that these adjustments should be performed correctly at this stage before the dynamic convergence procedure is carried out.

7. After having adjusted the picture shifts, etc., on a green picture, reconnect the convergence generator to produce a 625-line grid pattern. Adjust the red background control until a yellow grid appears and then alter the brightness and contrast controls (if necessary) so that the grid has a black background. Increase the blue background control for a white grid pattern at the centre of the screen. If any adjustment has been made to the position of the deflection coils or the purity magnets, or if any of the neck components or the C.R.T. have been replaced, the following procedure should be preceded by the adjustments given in 12.

8. The red and green field convergence is of the matrixed type and this means that the controls affect both red and green, but in opposite senses. Using a 625-line convergence grid, check that the centre convergence is correct and then turn down the blue background control. The red and green central vertical lines should be on top of each other; if not, the red/green field amp and tilt controls should be adjusted. Turn up the blue background control. If the deflection coils or the C.R.T. have been replaced, the red and green verticals may form an "S" with respect to the blue verticals; if so, the link wire at the bottom left-hand corner of the convergence panel should be moved to the other pin, and the above procedure repeated. Turn down the blue background control. The red and green horizontal lines should be on top of each other at the vertical centre of the screen. If not, the red/green field difference and field deflection coil balance controls should be adjusted. Turn up the blue background control, and, if necessary, re-set the centre convergence using the

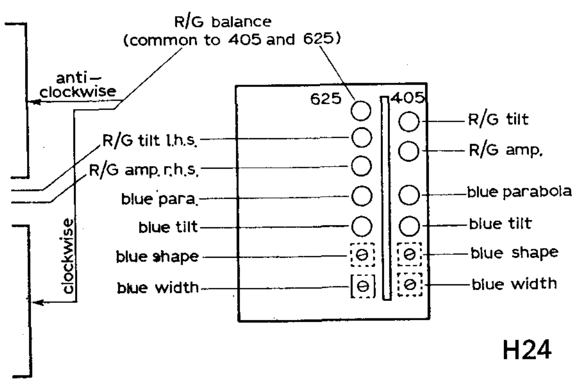
appropriate static convergence magnets. The centre convergence should be perfect on both 625 and 405.

9. The blue field amp and tilt controls should now be adjusted to register the blue horizontal lines on top of the red and green horizontal lines at the vertical centre of the screen. The blue field tilt control gives correction in both directions and is therefore a centre-zero control. The blue field amp control is at zero when fully anticlockwise.

10. The red and green line convergence is of the matrixed type and this means that the controls affect both red and green, but in opposite senses.

11. In the part of the procedure which follows, a number of cores have to be adjusted (with a standard "transistor" type trimming tool). Care must be taken not to screw the cores so far into the formers that they fall out and drop inside the receiver. The cores are locked in position by rubber string, and it is essential that the string remains with each core and is not lost when adjustments are made.

12. This adjustment should not be carried out unless the C.R.T. or any of the neck components have been replaced or removed. The line balance inductor has two coils on one former and is arranged so that a core may be moved between the coils. The "zero" position is when the core is central and affecting both coils equally. The adjustment provides a twist between red and green at the horizontal centre line of the screen. The correct setting is when the red and green lines coincide along the horizontal centre line.



(H24) Early Type of Convergence Panel—R and G Line Convergence (Baird 700 Series)

13. *Red/Green Line Balance.* This control is common to both 405 and 625 and is effective on the horizontal centre line. It is a centre-zero control whose action is to displace red and green in one direction when moved anticlockwise, and vice versa. The control should be adjusted in conjunction with the line deflection coil balance inductor (see preceding section) to align red and green on top of each other.

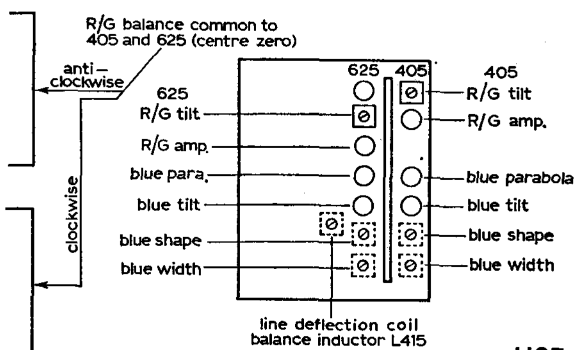
14. *Red/Green Tilt and Amp (625).* These controls affect the red and green verticals and should be adjusted so that the red and green verticals lie on top of one another where they cross the horizontal centre line. The 625 controls are on the left of the system switch. The red/green tilt control is an inductor with

two coils and one core, and the "zero" position thus occurs with the core centrally disposed between the two coils; the control mainly affects the right-hand side of the picture. Turn the red/green amp control to zero (full anti-clockwise) and adjust the red/green tilt control so that the vertical displacement of the red and green pictures is the same at each side of the screen, and in the same direction at each side. Then adjust the red/green amp control to align the red picture on top of the green. The controls interact, and the adjustments must be repeated to obtain overall convergence. Then, the red/green line balance control may be adjusted slightly to improve the convergence in the corners of the picture.

15. *Red/Green Tilt and Amp (405)*. Repeat the same procedure as for 625, with a 405-line convergence pattern and the receiver switched to V.H.F. Use the controls to the right of the system switch. The red/green line balance control is common to 405 and 625, and the setting arrived at on 625 should hold good for 405, but a compromise may have to be made.

16. *Line–Blue (625)—with a 625-line Convergence Grid-parabola, Tilt and Shape*. Turn the core of the blue shape coil using the transistor-type trimmer, until about ¾ in. of core can be seen protruding from the end of the former nearer the C.R.T. Care must be taken not to screw the core too far—it is only 1 in. long—or it will fall out of the coil former. Turn the blue parabola control to maximum (fully clockwise); this produces over-correction but allows the effects of subsequent adjustments to be seen more easily. Adjust the blue tilt

(H25) Later Type of Convergence Panel—R and G Line Convergence (Baird 700 Series)



H25

to give a symmetrical shape to the central blue horizontal line. Screw the core of the blue shape coil into the coil former (turn it anticlockwise) until the extremities of the blue lines are straight, particularly at the right-hand side of the screen. Take care not to screw the core too far into the coil. Reduce the blue parabola control to zero (fully anticlockwise) and then advance it until the central blue horizontal line is straight. If a straight line cannot be obtained, the core in the shape coil has been screwed in too far. It should be unscrewed and the process repeated.

17. *Blue Width (625)*. Adjust the blue width coil so that the blue vertical lines at the sides of the picture fall on top of the red and green vertical lines.

This coil has two windings and one core; the adjustment has minimum effect when the core is within one winding, and maximum effect when it is within the other winding. If adjustment of the core makes the error worse, the connections to the dynamic correction coils on the blue lateral magnet assembly must be reversed. It should be noted, however, that this alteration to the wiring should not be necessary unless parts such as the C.R.T. or deflection coils have been replaced.

18. *Line–Blue (405)—with a 405-line Convergence Grid.* Repeat the adjustments given under "Line–Blue (625)" using the equivalent 405-line controls.

19. *Repetition.* The above procedure will not necessarily give acceptable results the first time it is carried out, since many of the adjustments are interdependent. For that reason, the procedure should be carried out again, in part or in full as appropriate, until results are good. Care should be taken not to form the impression that once static convergence has been set up it should not be touched again. If, for example, a part of the procedure were reached and all the blue lines were displaced in a vertical direction from the yellow (red plus green) lines, and by the same amount all over the screen, then obviously the blue static magnet would be adjusted to make the blue raster coincide with the yellow lines.

Adjustments (A.G.C.):

1. *Equipment.* (*a*) A voltmeter with a sensitivity of 20,000 ohms per volt. (*b*) An oscilloscope with a flat Y response from D.C. to 3 MHz. It is essential that the oscilloscope be fitted with a divide-by-ten probe, and calibrated with the probe in circuit, and the oscilloscope switched to D.C.

2. Switch the receiver to 625-line operation and then disconnect the input lead of the I.F. panel (P3). Switch the voltmeter to a range of about 2·5 V F.S.D. and connect the positive lead to TP24. Adjust R105 until the reading is zero. Then, transfer the positive lead of the meter to TP5 (this is the emitter of Tr3); adjust R111 until the reading is 0·75 V.

3. Reconnect the I.F. input lead (P3) and connect the oscilloscope—via the probe—to TP6 (this is the base of Tr8) to enable the detected video waveform to be viewed. Tune in a 625-line transmission, taking care to ensure that the correct tuning point is reached. Check that the oscilloscope is connected for D.C. operation. Remove the probe from TP6 and connect it to its own earth connection. Adjust the undeflected trace on the oscilloscope to a convenient calibration line, and then connect the probe to TP6 once more. Adjust R99 to set the detector so that the tips of the syncronisation pulses are 3 V above chassis potential.

4. Switch the receiver to 405-line operation, tune in a transmission, and adjust R93 to set the output of the detector so that the peak white level of the video signal is at 3 V above chassis potential. It will be necessary to perform this adjustment when a picture containing some peak white is being transmitted. The test card is particularly useful in this respect since it gives a steady trace on the oscilloscope.

Adjustments (Decoder Panel):

1. *Equipment.* (*a*) A multi-range meter with a sensitivity of 20,000 ohms per volt. (*b*) A calibrated double beam oscilloscope similar to Telequipment type D43. (*c*) Three probes, two (A and B) should be divide-by-ten, and one (C) should be straight through. (*d*) A standard transistor type trimming tool. (*e*) A shorting link about 4in. long. (*f*) A piece of insulated wire 4in. long, with suitable pin and socket, for extending video lead to P8.

2. *Signals.* (*a*) A standard colour bar signal. (*b*) Unmodulated signals at 6MHz and 3·7MHz from a conventional R.F. signal generator.

3. Unplug the video input from the panel (P8) and release the panel from the clips on the left-hand side, top and bottom, to enable it to be hinged outwards from the chassis. This will reveal P10 which should be unplugged.

4. Connect one lead of an ohm-meter to the earth-print of the panel and apply the other lead in turn to H.T. + (red wire); the +25V line (pink wire); and the −25V line (yellow/brown wire). The reading on the H.T. line should be high (increasing as C273 charges up), and on the +25V and −25V lines, in the region of 500 to 1000 ohms.

5. If all is in order, plug in P10 and check that the flying leads from the base panel of the C.R.T. are connected to P13, P14, P15 and P16 (the lead to P13 is particularly important since the PFL200, V5, will be damaged by excessive screen dissipation if it is left unconnected). Extend the video output lead of the I.F. panel by about 4in. to enable it to be connected to P8 on the decoder panel while the latter is still hinged away from the chassis.

6. Switch on the receiver and check that the decoder H.T. line potential is correct (+260V) and that the +20V and −25V lines are approximately correct.

7. Turn down the colour (saturation) control R302 to minimum and connect V.H.F. and U.H.F. aerials. Check that a good monochrome display is obtained on both line standards.

8. Check that the brightness control has to be set near to its maximum value on a normal picture when the background controls are near their maximum settings. If this is not so, the red/white flying lead at the top of the decoder panel must be moved to W, X, Y or Z, as appropriate, so that a satisfactory range of adjustment is obtained on the brightness control (switch the set off before moving the lead).

9. *Luminance Channel.* With the receiver switched off, connect an ohm-meter across L230—this component is at the top-left corner of the panel, and the connections are easily reached on the print-side. A low reading should be obtained, signifying that the coil and its connections are in order. If the reading is high, check that L230 has not been damaged.

10. The colour bar signal is now required. Check that the D.C.-restoring circuit of the luminance stage is working (diode D24 and associated components). The easiest way of doing this is to adjust the background controls for a grey picture with the colour control R302 turned right down. If the setting of the contrast control is now altered, the black level of the picture should appear to be clamped. Look at the seventh and eighth (blue and black) bars of the

display; if the black level varies considerably, the D.C. restorer is not working and components D24, R347, R355, R358, R357, R356 and C304 should be checked.

11. Set the oscilloscope to 10 V/cm sensitivity and connect it via probe A to P19, the fixed-drive pin on the C.R.T. base panel. Check that the line syncronisation pulses are present.

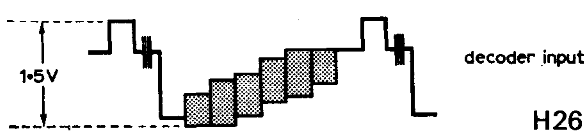
12. Transfer probe A to the grid of V5b (pin 8) and set the oscilloscope to 0·2 V/cm. Unscrew the core of L201 (the sub-carrier rejector in the emitter circuit of Tr32) until most of the core is outside the coil former. Observe the blocks of sub-carrier present on each "coloured" step of the colour bar signal and screw the core of L230 into the coil until it is centrally located within the coil former. Then, screw the core out again until a point is reached when any further withdrawal of the core would cause a reduction in the amplitude of the sub-carrier.

13. Adjust L201 to reduce the blocks of sub-carrier to a minimum. Further rejection of sub-carrier is given by L233 which is mounted on the base panel of the C.R.T.; it is therefore not part of the decoder panel, but its adjustment should be checked at this stage. Transfer probe A to P19 on the base panel of the C.R.T. and adjust L233 for minimum amplitude of sub-carrier.

14. *Sub-carrier (reference) Oscillator*. Switch the oscilloscope to A.C. and a sensitivity of 1 V/cm. Connect it via probe A to the junction of R221, L205 and C216—connect the probe to the short bare-wire link adjacent to the right-hand end of C216. Adjust the collector coil of Tr23 (L206) for maximum amplitude of sub-carrier. It is particularly important that this adjustment is correctly performed.

15. Connect probe A to TP28, the cathode of the (R–Y) demodulator. Adjust the top core of L207/L210 for maximum output, 12 V to 15 V peak-to-peak.

16. Transfer probe A to TP27, the cathode of the (B–Y) demodulator. The signal viewed should be similar to that on TP28.



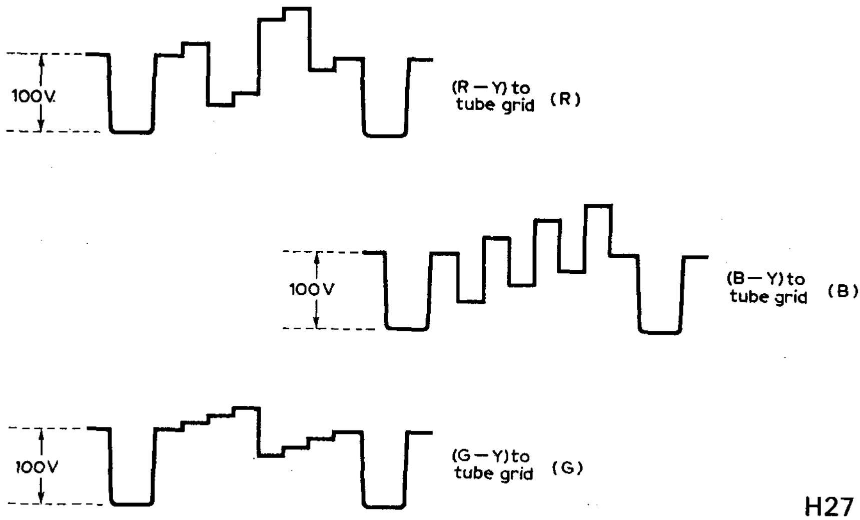
H26

(H26) The Video Colour Bar Signal (P8) (Baird 700 Series)

17. *A.P.C. Loop*. Switch the colour killer switch S6 to "disabled" (to the right). Connect probe A to TP25, the collector of Tr21, and adjust the oscilloscope to a sensitivity of 0·5 V/cm. Adjust the burst gating control R249 until the waveform has an amplitude of about 15 V peak-to-peak (3 cm). Check now that the core of L205 is about ⅜ in. into the coil former (the core should be wholly within the coil former). No further adjustment will be made to L205, the object being to position the core for maximum inductance of the winding.

18. Adjust L202 (collector circuit of Tr20) and L204 (collector circuit of Tr21) for maximum output.

19. Return the burst gating control R249 to its zero setting (fully anti-clockwise) and remove probe A from TP25. Check that the phase detector balance control R214 is set centrally. Earth TP17 (the base of Tr21) with the shorting link and connect the multirange meter on its 25 V D.C. range to TP18, the collector of Tr22. Adjust R225 until the reading at TP18 is 6 V. If this reading cannot be obtained, set R225 for a reading as near 6 V as possible; 5 V to 7 V is acceptable. A slight adjustment of R214 may be made to obtain 6 V at TP18.



(H27) Idealised Colour Difference Signal (Baird 700 Series)

20. Remove the earth link from TP17 and the reading on the meter will probably alter. Adjust R214 to restore a reading of 6 V. Disconnect the meter. Turn the colour (saturation) control R302 until moving bands of colour are seen on the screen. Adjust the frequency of the reference oscillator by means of C220 until each colour bar is of one colour only; the bars will then be drifting across the screen in a horizontal direction. Note that no reds will be visible in the display since the switch generator circuit is quiescent until the A.P.C. loop is locked.

21. *Burst Gating.* Turn R249 clockwise until the colour bar display locks and becomes stationary. If the reds are still not present, turn R249 a little further until the switch generator becomes operative and the reds appear. Advance the control a further 10 degrees rotation.

22. Check the performance of the A.P.C. loop on a weak signal by attenuating the aerial signal until the picture is very noisy. A slight re-adjustment of the phase detector balance control R214, or the burst gating control R249, may be necessary to obtain adequate performance.

23. Now check that the circuit locks quickly on all levels of signal—vary the attenuation of the aerial signal and unplug and re-insert the aerial plug for each level of signal. (A quick method of altering the aerial signal is to hold the aerial plug at various distances from the aerial socket.)

24. *7·8 kc/s Switch Generator.* View the video input to the decoder (P8) on one beam of the oscilloscope via probe A and display the signal present at the collector of Tr24 with the other beam, via probe B. The latter point is reached by connecting the probe to the lower end of R252 which is to the right of Tr24. Set the timebase of the oscilloscope so that at least two lines of picture are displayed. The sine-wave on the collector of Tr24 will then form a horizontal figure-of-eight pattern, the cross-over points of the waveform indicating where it passes through zero.

25. Adjust L216A for maximum amplitude of the sine-wave present at the collector of Tr24. Then re-adjust L216A so that the sine-wave passes through zero coincident with the trailing edge of the line syncronisation pulse. Transfer probe B to the collector of Tr25 (TP19), and adjust L216B for maximum amplitude of the signal, and then so that the cross-over points of the waveform are coincident with the trailing edge of the line sync pulse.

26. Connect probe B to the anode of D26 and check that the positive top of the waveform more than covers the active line period. Then, connect probe B to the anode of D27 and check that the positive portion of the waveform present there more than covers the active line period. If the waveforms are not correct, adjust L216B until they are correct. The durations of the level positive portions of the two positive periods more than covers the active line period.

27. *Colour Difference Signals.* Switch both amplifiers of the oscilloscope to 10 V/cm and connect probe A to the (B–Y) output, P14. Connect probe B to the (R–Y) output, P15. Turn the colour (saturation) control R302 to minimum. Turn the background controls to maximum and reduce the settings of two of them until a grey picture is obtained (this adjustment must be performed in conjunction with the contrast and brightness controls). Earth TP17 with the shorting link and note any resulting change in the background colour of the display. Remove the earth connection from TP17 and then adjust L221 to make the background return to the noted colour.

28. Increase the setting of the colour (saturation) control R302 to obtain a normal colour bar display and check that the (R–Y) and (B–Y) waveforms are of the correct shape. Adjust the top core of L207/L210 and check that only the amplitude of the waveform changes.

29. Before the amplitudes of the colour difference signals can be finally adjusted, the phase of the reference oscillations fed to the synchronous detectors must be set correctly. With the oscilloscope connected as above, to P14 and P15, adjust the top core of L207/L210 for maximum (R–Y) signal, and the bottom core for maximum (B–Y) signal.

30. Disconnect probe A from the (B–Y) output and switch the associated Y-amplifier to 1 V/cm. Connect probe A to TP27 and TP28 in turn and check that the amplitude of sub-carrier present on each test-point is not less than 10V peak-to-peak. If the amplitude is less than 10V peak-to-peak, adjust the top

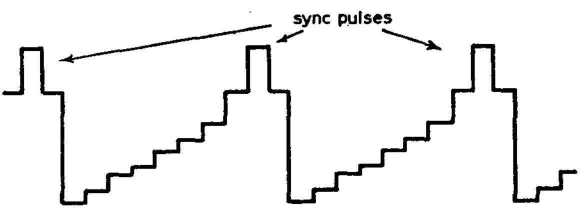
core of L207/L210 to increase the amplitude. Then, rotate the core of L202 a turn or so either way and leave it in the position which results in maximum (R–Y) signal.

31. Reconnect probe A to the (B–Y) output and switch the associated amplifier to 10 V/cm. Re-set the (R–Y) and (B–Y) line blanking pulse control R330 to obtain 100 V pulses at the two outputs—P14 and P15. Transfer probe A to the (G–Y) output, P16. Turn the (R–Y) and (B–Y) gain controls R295 and R292 to maximum.

32. Assume that the colour bars are numbered 1 to 8 from left to right (viewing the screen directly). Turn the (R–Y) and (B–Y) gain controls R295 and R292 to maximum. Turn the red and green background controls to minimum. Adjust the colour (saturation) control R302 (which is on the front of the set) until bars 1, 3, 5 and 7 are of equal brightness.

33. Turn the blue and green background controls to minimum. Adjust the (R–Y) gain control R295 until bars 1, 2, 5 and 6 are of equal brightness. If the required (R–Y) gain is greater than the maximum obtainable, the colour (saturation) control R302 should be advanced to give the correct red display and then the (B–Y) gain control R292 should be reduced to a position giving the correct blue waveform with that setting of the colour (saturation) control R302.

(H28) THE VIDEO SIGNAL AT P19 (BAIRD 700 SERIES)



H28

34. The probe of the oscilloscope should still be connected to the (G–Y) output, P16, and now the matrixing pots. R309 and R321 should be adjusted until the correct (G–Y) waveform is viewed on the oscilloscope. The (G–Y) waveform must be of the correct amplitude as well as shape, and this is checked by viewing the colour bar display with the red and blue background controls turned to minimum. Bars 1 and 3 must be equal in brightness to bars 2 and 4, and if the brightnesses are different, R309 and R321 must be altered to reduce the difference while preserving the correct (G–Y) waveform on P16 (viewed on the oscilloscope).

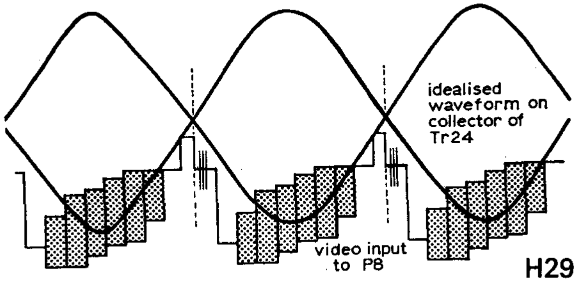
35. As adjustments to R309 and R321 alter the (G–Y) blanking pulse, R331 must now be re-adjusted for line blanking pulses of 50 V on the (G–Y) output, P16. Turn the colour (saturation) control R302 to minimum and adjust the background controls for a correct grey picture—one of the controls should be at maximum and the other two as near maximum as possible.

36. *Chrominance Amplifier*. Switch the oscilloscope to 0·1 V/cm sensitivity and connect it via the direct probe (C) to TP20. Apply a colour bar signal and check that the line blanking pulse is gating out the colour burst. Next, check

that the colour (saturation) control R302 is working correctly. Place the colour killer switch S6 in the "disabled" position—to the right. Turn the colour (saturation) control R302 to just below its maximum position.

37. Remove the colour bar signal and connect the signal generator to the input socket of the decoder panel (P8) and tune it to 6Mc/s, unmodulated. Inject at least 100mV R.M.S. and view the waveform on TP20 via probe C (as above). Set the timebase of the oscilloscope so that the waveform is displayed as a band of light and adjust the 6Mc/s rejector L212 for minimum amplitude of 6Mc/s signal at TP20. Now tune the signal generator to 3·7Mc/s and adjust L211 for maximum output.

(H29) WAVEFORM OBTAINED DURING ADJUSTMENT OF L216A (BAIRD 700 SERIES)



38. *PAL Delay Line Circuitry*. Operate the receiver on a colour transmission. Make sure that the sub-carrier (reference) oscillator is locking correctly. Connect the oscilloscope via probe C to the cathode of D26 and display the chrominance signals present there.

39. Make up a lead with a 10pF series capacitor, and connect it between pin 1 of V5a and TP20. Check that the sub-carrier oscillator is still in a locked condition (by observing the screen of the receiver), and then turn the colour (saturation) control R302 to minimum. Adjust the gain control (R275) of the delay line amplifier in conjuction with the phase control inductor L213 until the amplitude of the 4·43 MHz signal shown on the oscilloscope is at a minimum.

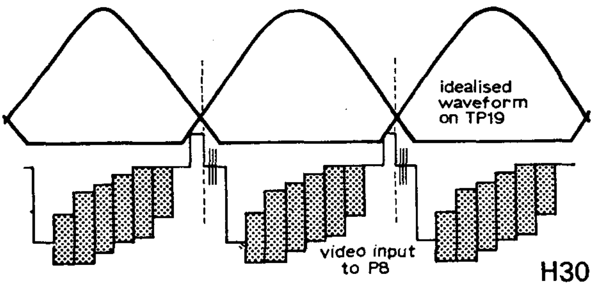
40. Remove the lead and 10pF capacitor, and check for correct operation by turning the colour (saturation) control R302 to a normal working level and inspecting the colour picture to ensure absence of Hanover bars.

Adjustments (Timebase and E.H.T. Sections):

1. The following information deals with the adjustments needed in the timebase and E.H.T. sections when, for example, the line output transformer, the E.H.T. tripler, or the timebase panel has been replaced. It will also be necessary to go through some or all of the procedures after replacing certain components in the timebase and E.H.T. sections.

2. *Equipment*. (*a*) A multirange meter with a sensitivity of 20,000 ohms per volt. (*b*) An E.H.T. voltmeter of at least 20,000 ohms per volt sensitivity and a F.S.D. of 25kV. (*c*) An oscilloscope similar to Telequipment D43. (*d*) A divide-by-ten probe for the oscilloscope. (*e*) Two shorting links each consisting of about 2 in. of insulated wire.

(H30) WAVEFORM OBTAINED DURING ADJUSTMENT OF L216B (BAIRD 700 SERIES)

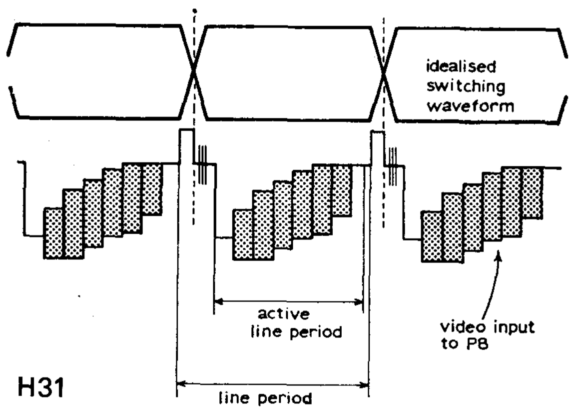


3. *E.H.T. Fuse.* The E.H.T. supply is fused by F3, rated at 100mA. The correct type must be used if it is replaced.

4. *Preliminary Settings.* Set the two E.H.T. voltage pre-set resistors R484 and R485 to minimum resistance; each slider must be at the top of its track. Screw the core of L405 (width) about half-way into the coil and set the E.H.T. current pre-set resistor R496 to the mid-point of its travel. Connect V.H.F. and U.H.F. aerials and clip the negative lead of the E.H.T. voltmeter to the chassis of the receiver. Switch the receiver on, and set it to 625-line operation. Tune it to a test-card transmission, using the sound as a guide to tuning if the picture is not locked at this stage. Now set the line and frame holds approximately (to obtain a starting-point for more detailed checks and adjustments).

5. *Line Holds.* Use one of the shorting links to connect TP32 to TP31, thus shorting out the line stabilising coils (care should be taken here since both TP31 and TP32 are connected to H.T.). Use the second shorting link to connect together TP30 and TP36 (TP36 is connected to chassis). Adjust the 625 line hold control R477 until the picture resolves and runs through in a horizontal direction. Remove the link from TP31 and TP32 and adjust the core of the 625 line stabilising coil L432 until the picture is once again resolved and running through in a horizontal direction. Now remove the link from TP30 and TP36 and check that the picture locks. The line synchronization must be correct on 625 before adjustments can be made on 405.

(H31) SWITCHING WAVEFORM FOR D26 AND D27 (BAIRD 700 SERIES)

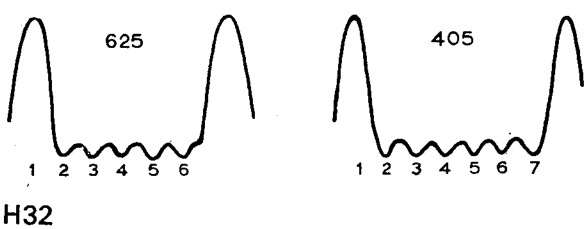


6. Tune in a 405-line test card and repeat the above procedure, shorting the same pairs of test points and adjusting the equivalent 405 components—R478 (line hold control) and L431 (405 line stabilising coil).

7. *Width and Line Linearity.* Switch the receiver back to 625 and set the width control (the core of L405) for the usual degree of overscan (so that the central circle on the test-card looks correct when the height is set correctly). Switch the receiver to 405 and check that the width is adequate (there is no separate width adjustment for 405-line operation). Adjust the line linearity control (the magnet of L407) for optimum results on both line standards and re-set the width control if necessary.

8. *Line Tuning.* Switch the receiver to 625 and adjust the contrast and brightness controls for a normal picture. Connect the probe of the oscilloscope to the top end of R247, 2·2k (this resistor is on the decoder panel and provides a convenient means of displaying the 60 V pulse from the line output transformer). Adjust the 625 tuning coil L402 for minimum ringing consistent with six peaks in the waveform.

9. Switch to 405 and re-set the brightness to the same level as it was on 625 during the preceding adjustment. Adjust the 405 tuning coil L403 for minimum ringing consistent with seven peaks.



(H32) LINE TUNING WAVEFORMS (BAIRD 700 SERIES)

10. *E.H.T. Voltage and Current.* Connect the E.H.T. probe to the anode connector of the C.R.T. by sliding the tip of the probe beneath the red insulating cap. Take care with this operation and keep the fingers well away from the E.H.T. connector and the point of the probe. Switch the receiver to 625 and adjust the E.H.T. voltage pre-set resistor R484 for 24kV. Switch to 405 and adjust R485 for 24kV E.H.T. Remove the E.H.T. probe from the receiver.

11. Switch to 625 and black out the C.R.T. by adjustment of the contrast and brightness controls. Connect the multirange meter, on its 2·5V range (D.C.), across R513, the 1k cathode resistor of the shunt stabiliser valve V22—the resistor is connected between pin 1 of the valve and chassis. Adjust the E.H.T. current pre-set resistor R496 for a reading of 1·2V across the 1k resistor R496. This reading indicates an E.H.T. drain of 1·2mA.

12. Observing the same precautions as before, check that the E.H.T. voltage on 625 is still 24kV and adjust R484 if necessary. Switch to 405 and check that the E.H.T. is still 24kV, and adjust R485 if required.

13. *Focus.* Adjust the contrast and brightness controls for a C.R.T. beam current of 700 μA—this is represented by a reading of 0·5V across the 1k

resistor R513. Set the focus control for optimum results and remove the voltmeter. If the focus control has to be at one end of its range, or if optimum focus does not occur within the range of the control, it will be necessary to vary the coarse settings of the focus circuit. Determine by inspection whether the focus potential needs increasing or decreasing—if the focus control gives best focus when it is fully clockwise, the potential needs decreasing, and vice versa. Then switch the set off.

14. The two "outer" connections of the focus potentiometer are fitted with flying leads (on the reverse of the printed panel) and these can be moved up or down the chain of 5.6M resistors (R502 to R506) as required. There are only two possible settings of the leads since the focus control must always be connected across three consecutive resistors of the chain—R502, R503 and R504, or R503, R504 and R505. If the focus control was at the clockwise end of its travel, a lower focus potential is required and the connections of the control must be moved from the junctions of R501/R502 and R504/R505 to the junctions of R502/R503 and R505/R506. If the focus control was at the anticlockwise end of its travel, then a higher focus potential is required and the connections of the control must be moved from the junctions of R502/R503 and R505/R506 to the junctions of R501/R502 and R504/R505. The above adjustments may be followed easily by reference to the circuit diagram.

15. To alter the connections of the focus control, the chassis should be placed in the servicing position to allow access to the rear of the convergence panel where the flying leads are located. Afterwards, replace the chassis in the cabinet, switch the receiver on, and check that optimum focus is obtained with the focus control towards the centre of its range, and not at one end of its travel.

16. If neither of the two possible settings of the leads gives correct results, a fault is present, and C461, the focus control R489, and the chain of resistors R499 to R508 should be checked.

17. *Field Hold.* Check the setting of the field hold control. It will probably be found that the field will lock over the full range of the control, and it should therefore be set to give optimum interlace of the picture. If the interlace cannot be improved by setting the control to a particular point of its range, leave the control at the fully clockwise end of its travel (maximum resistance).

18. *Field Linearity and Height.* Set the field linearity for optimum results, adjusting the main control R430 first and then the "top" control R428. The height controls R404 and R402 should then be adjusted on 625-line and 405-line operation respectively. It may then be necessary to re-adjust the linearity controls slightly.

19. *Background Compensation (R441).* Switch the receiver to 405-line operation and adjust the background controls for a grey picture (one of the controls must be at maximum, and the other two reduced as appropriate). Turn the colour (saturation) control to minimum and switch the receiver to 625. Adjust R441 until the background colour on 625 is the same as it was on 405.

20. *Other Adjustments.* It may now be necessary to adjust the picture shift controls. These are R420 field and R495 (line) and they are mounted on the

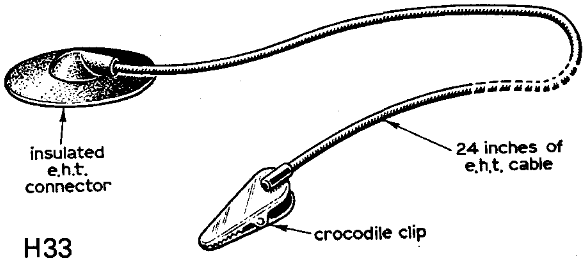
power supply panel. Extend the lead to P8 and unclip the decoder panel to allow it to be hinged away from the chassis—the shift controls may now be reached. The adjustments should be performed while viewing the picture in a mirror, and care should be taken to keep the hand away from live parts of the receiver.

21. If either shift control moves the picture in the wrong direction, the receiver should be switched off and the flying leads of the control transposed.

BAIRD 710 Series

General Description: Dual-standard colour TV receivers for reception of black-and-white programmes on the 405-line standard, and colour and black-and-white programmes on the 625-line standard.

Rapid Chassis Identification: Consists of two units—main chassis and separate tuner section with user controls. Five vertically mounted printed panels within the upright section of the main chassis, with a further printed panel on top of the main chassis tray. 25 kV V.D.R. unit at bottom right, with knurled red ring for focus adjustment. Convergence panel removable to facilitate adjustment. Line output transformer and E.H.T. tripler unit mounted behind timebase panel. Solenoid-operated system switching linked to three printed panel switches by a horizontal shaft.



(H33) Lead for Discharging C.R.T. (Baird 710 Series)

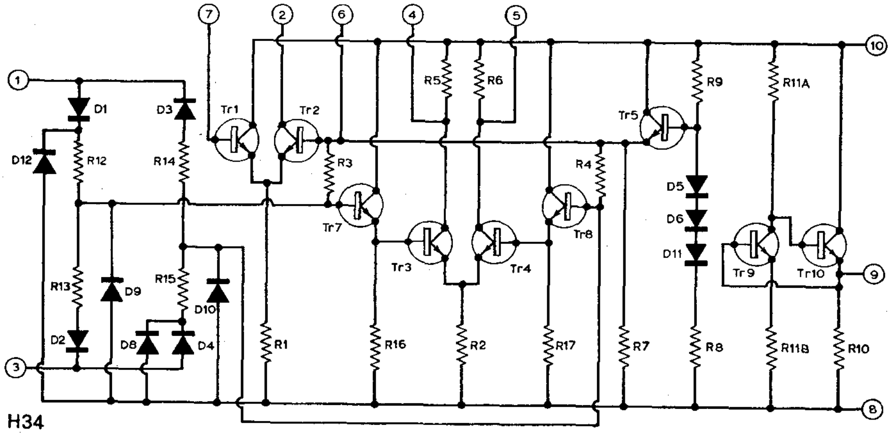
Mains Supply: When the back of a receiver is removed to allow servicing to be carried out, check immediately after switching the receiver on that the chassis is connected to the neutral side of the mains supply and not the live side. If possible, measure the potential between the chassis of the set and earth with an A.C. voltmeter, or use a neon screwdriver to check that the chassis of the set is not live (no indication). However, before it can be assumed that lack of an indication means that the chassis is safe, it is essential to check that the neon will light when it is connected to the live side of the mains. The mains connector of the receiver is of the polarised type (a suitable free-socket being supplied with each set). The upper pin of the mains connector is the one which is wired to the chassis of the receiver and it must therefore be connected to the neutral side of the mains supply.

E.H.T.: The E.H.T. circuits of colour sets have a much lower source impedance than black-and-white E.H.T. circuits since the maximum drain is in the region of 1·25 mA, representing some 30 W of power at 24 kV. For this reason, the E.H.T. supply circuits in a colour receiver should not be treated lightly. It is most important that *no* attempts be made to draw sparks from any part of the E.H.T. supply circuit, either to an insulated screwdriver, or to the chassis. Coatings on the inside and outside surfaces of the C.R.T. are used to form a capacitor for E.H.T. smoothing, just as in black-and-white sets, and it is essential to discharge the tube before beginning certain servicing procedures.

Circuit Description: The circuitry is similar, in many respects, to that of the 700 Series chassis. Therefore, the information on the 700 Series in this and the 1967–68 and 1968–69 volumes should be noted. The new and different circuitry is described below.

Push-button U.H.F. Tuner: The U.H.F. tuner in the 710 Series has four push-buttons instead of the manual tuning employed in the 700 Series. Each push-button may be tuned over the whole of Bands IV and V and, to correct for tuning errors, an A.F.C. circuit controls the frequency of the local oscillator in the U.H.F. tuner.

A.F.C. Circuit: The function of the A.F.C. circuit is to accept a 39·5 MHz signal from the last stage of the vision I.F. amplifier and supply a control potential to the oscillator section of the U.H.F. tuner to correct for tuning errors and drift. An R.C.A. integrated circuit type CA3034V1 is employed and it contains a 39·5 MHz amplifier/limiter and a discriminator network which is driven from an external phase-shift transformer. The output of the detector drives a high-gain D.C. amplifier which provides the control potential for application to the U.H.F. tuner. The integrated circuit contains its own stabilised voltage supply.



(H34) Integrated Circuit Type R.C.A. CA3034V1 (Baird 710 Series)

Integrated Circuit (CA3034V1): The integrated circuit provides all of the signal processing components with the exception of the phase-detector transformer L48/L49/L50. The other components used in the circuit are the decoupling capacitors (C102, C119, C120 and C129), an input signal coupling capacitor (C99), a gating diode (D7), and a power supply resistor (R81). Tr1 and Tr2 constitute a 39·5 MHz differential amplifier/limiter which supplies a peak-to-peak output current of about 4 mA for inputs in excess of 100 mV.

Detector: The diode matrix D1, D2, D3, D4 and D8, D9, D10, D12, constitutes a balanced detector which converts the output of the phase-detector transformer to a filtered D.C. signal. Diodes D1, D2, D3 and D4 perform the detection, while diodes D9 and D10 are always reverse-biased and serve as capacitors (in conjunction with R12, R13, R14 and R15, they filter the output of the detector). Diodes D12 and D8 are included to balance parasitic diodes which exist between the cathodes of D2 and D3 and the substrate of the device.

Transistors Tr3, Tr4, Tr7 and Tr8 are a differential amplifier of high input impedance. This amplifier is directly coupled to the output of the detector and contributes greatly to the high sensitivity of the A.F.C. system.

A stabilised source of bias for the amplifier is maintained by Tr5 and its associated diodes and resistors. The regulation circuit is designed to maintain a constant "zero tuning error" potential at the output of the amplifier over the range of operating temperatures. The circuit also provides bias for the diodes and capacitors in the detector circuit.

The 625 vision carrier (39·5 MHz) is extracted from L36, the primary winding of the band-pass transformer in the last vision I.F. stage. The signal is fed via a short length of coaxial cable to the A.F.C. panel, which is mounted above the main I.F. panel

The integrated circuit and its associated phase-shift transformer produce a D.C. potential which is nominally 5·5 V when the receiver is correctly tuned to a U.H.F. transmission, and which varies by ± 4V when tuning errors are encountered.

Obtaining Correct Lock: Diode D7 (on the A.F.C. panel) is used as a gate to switch off the A.F.C. circuitry if the system becomes locked on to the sound carrier instead of the vision carrier (during the initial tuning of the receiver, for example). When the A.F.C. circuit is correctly locked on to the vision carrier, D7 is reverse-biased by the D.C. potential existing across R59 and R71 (the load of the sound ratio detector) and therefore has no effect on the A.F.C. circuitry.

Under conditions of false-lock, the 6 Mc/s drive to the sound section of the receiver is reduced to a low level since the vision carrier then falls outside the vision passband. This reduces the D.C. potential across R59 and R71, forward-biasing D7 and thus connecting the input signal of the A.F.C. panel to chassis via C102. The system is thus rendered inoperative until the tuning controls are adjusted so as to bring the vision carrier within the pull-in range of the A.F.C. network to restore correct locking of the circuit.

Control: The D.C. correction potential is fed to a variable-capacity diode D6 which is situated in the local oscillator cavity of the U.H.F. tuner. This

diode is always reverse biased, and by a combination of inductive and capacitive coupling to the oscillator line L13, control of the frequency of the local oscillator is achieved.

Components R24 and C59 remove any residual low-frequency modulation components existing on the A.F.C. line.

Decoder: The decoder used in the 710 Series is identical to that used in the modified version of the 700 Series, which is described in this volume.

Line Oscillator: Synchronization from the anode of V15b is fed via C432 to the phase comparator diodes D31 and D32. A sawtooth voltage from the line output transformer is fed into the comparator circuit across C433 and a sharpening pulse from the deflection coils winding is applied via R463 and C439. The output from the phase comparator is smoothed by R467/C436 and R466/C435, and fed to the grid of V17a.

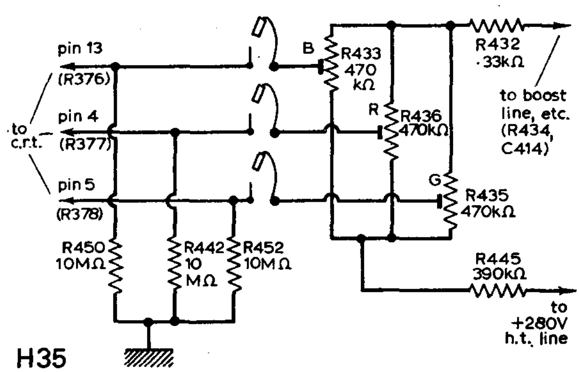
V17, PCF802, is the line oscillator. The pentode section operates as a Hartley oscillator with the tuned circuit between the screen and control grids. The anode circuit is electron-coupled to the oscillator and isolates it from any variations in load.

The triode section of V17 forms a reactance valve but does not have the conventional capacitor between anode and grid; instead, two phase-shift circuits are employed giving feedback to the cathode circuit to ensure a 90 degree phase shift between anode and cathode waveforms. These phase-shift networks are C423/R476 from R461 the H.T. feed to the tap on the tuned circuit, and C442/R476 from R473, the cathode load in the oscillator circuit. The latter feedback also produces a negative resistance in the anode circuit of the triode which reduces the damping on the tuned circuit of the oscillator.

The anode of the triode is connected to the junction of L433/C426 in the grid circuit of the oscillator to give a direct coupling, avoiding the conventional duplication of components.

The line hold control, R477, alters the D.C. conditions of the triode, thus changing the capacitive reactance across the oscillator coil L433, the core of which provides a pre-set adjustment of line hold on 625. C424, brought into circuit by the system switch, gives pre-set adjustment of line hold on 405.

(H35) Background — Pin Circuitry (Baird 710 Series)



Line Output Stage: V18 is stabilised by negative feedback from the line output transformer. The feedback is developed across a V.D.R. in the grid circuit and is therefore sensitive to variations in mains voltage and changes in E.H.T. load. A pre-set potentiometer (R484 or R485) adjusts the feedback level and is used to set the E.H.T. potential.

The line output transformer T401 uses core FX3187/8 which is smaller than the core used in the 700 Series. This is permissible since the E.H.T. overwind is physically smaller. The paxolin panels of the E.H.T. tripler have been reduced in size and the tripler is now mounted vertically at the side of the line output transformer. The transformer is tuned by C450 and C451 to seventh and ninth harmonics on 625 and 405 respectively. No external tuning coils are required and the regulation of the E.H.T. supply is improved.

T401 feeds the efficiency diode V19. The deflection coil winding is centre-tapped to feed the line convergence circuitry and to allow line shift current to be introduced.

The 405 tap on the deflection coil winding feeds the blue lateral coils via the blue width control L412 or L413.

The overwind on the transformer produces an 8 kV pulse which is converted by a voltage tripler circuit to 24 kV to feed the C.R.T.—the tripler consists of D36, D37, D38, D39, D42, C475, C476, C480 and C481.

E.H.T. Stabilisation and Focus: The V.D.R. E298ZZ/104, R496 and R497 are connected across the E.H.T. The V.D.R. provides some form of E.H.T. regulation and the reference potential developed across R497 is fed via R483 to the control grid of the line oscillator V17. The potential thus controls the drive waveform to the line output valve V18, thus determining the current through V18 and hence the E.H.T. The V.D.R. also acts as a limiting resistor, keeping the minimum E.H.T. current at about 100 μA (when the C.R.T. is taking no E.H.T. current).

The V.D.R. E298ZZ/104 is provided with a sliding contact on its lower section, the position of the contact being adjusted by turning the knurled red plastic ring of the V.D.R. assembly. The sliding contact supplies the potential for the focus electrode of the C.R.T.

C.R.T. Beam Current Limiting and A.G.C. Setting: A circuit is provided to limit the beam current of the C.R.T. The current in C481 develops a pulse voltage across C482, and this is D.C. restored by D44. R499 and C483 are smoothing components which provide a positive potential proportional to the beam current of the C.R.T., and this positive potential is applied to the base of Tr10 via R500. Thus, the base potential of Tr10 is increased as the C.R.T. beam current increases, reducing the contrast level by altering the A.G.C. The maximum beam current of the C.R.T. is therefore limited to a safe value.

Since the A.G.C. system is influenced by the beam current of the C.R.T., the adjustments of the A.G.C. circuitry must be carried out *with the C.R.T. blacked out.*

Line Shift: An additional winding on the line output transformer T401 produces a 60 V pulse for burst gating (on the decoder panel), and a positive pulse of about 600 V amplitude is taken via C611 from one side of the deflection

coils to V8b (on the decoder panel) for line blanking.

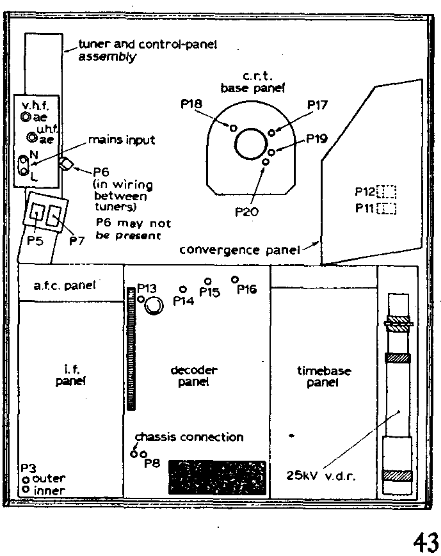
The winding providing the 60V pulse is connected via R493 to C473/D43. The diode D43 conducts on scan, charging capacitor C456 and developing a D.C. potential across R495. L416 may be connected to either end of R495 and a variable positive or negative potential is thus provided for line shift—and applied via L416, through the line deflection coils, and back through a winding on the line output transformer to chassis.

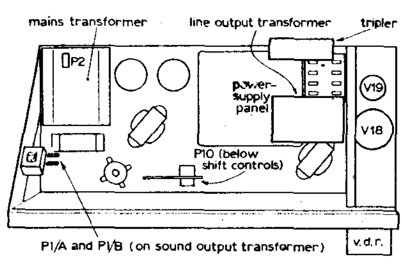
L416 prevents the line shift potentiometer R495 from shunting the deflection coils to any great extent, and the "S"-correction capacitors C453 and C455 prevent the D.C. shift current from flowing in the associated winding on the line output transformer.

Line shift in the 700 Series was obtained by passing part of the cathode current of V18 through the line deflection coils, but this method could not be employed in the 710 Series since the current in V18 is not constant, due to the absence of the shunt stabiliser, and the line shift would therefore vary with changes in E.H.T. load.

Frame Convergence Circuit: The matrixed frame convergence circuit used in the modified 700 Series is employed in the 710 Series. A combination of sawtooth and parabolic waveforms is applied to the frame convergence coils. Sawtooth currents from the centre-tapped secondary winding of T400 are applied to the blue and red/green coils via R444 and R454, and the parabolic waveforms derived from the cathode circuit of V16 via C420 and shaped by R447 are fed to the blue and red/green coils by potentiometers R448 and R449. Since the red and green coils are in series, a red/green difference control is necessary (R453).

A removable link at the bottom left-hand corner of the convergence panel connects C421 in circuit to modify the parabolic waveform. The link is normally set so that C421 is in circuit, but if the red and green verticals are





H36

(H36) The Locations of the Various Plugs and Sockets in the Receiver—the Designations P4 and P9 are not used (Baird 710 Series)

found to form an "S" with respect to the blue verticals, the link may be moved to the other pin to disconnect C421.

Background Control Circuit: The circuit diagram does not show the revised background control circuit. This is shown, on its own, in a separate diagram.

The values of the background controls have been altered from 2 MΩ to 470 kΩ, and a 390 kΩ resistor (R445) has been introduced between the 280 V H.T. line and the three background controls. The three 10 MΩ resistors (R442, R450 and R452) ensure that the first anodes of the C.R.T. are not left "floating" when the background pins are disconnected.

The new circuitry enables any or all guns of the C.R.T. to be extinguished (by disconnecting the appropriate pins) without disturbing the settings of the three background controls. This will be found of great use during the setting up of receivers.

The circuit is arranged so that the bare pins on the convergence panel assume chassis potential when disconnection is carried out. Since the removable sockets remain live, care should be taken that the insulating sleeving is always in place, and that only one hand is used when making a disconnection or reconnection.

The background pins are located on the left-hand edge of the convergence panel.

Mechanical Details

1. The chassis used in the 710 Series of colour receivers is very similar to that used in the 700 Series. However, the 710 Series chassis is smaller since there is no E.H.T. stabiliser compartment at the right-hand end. Stabilisation of the E.H.T. is achieved by a V.D.R. connected across the E.H.T. supply, and a sliding contact on the V.D.R. supplies the focus potential for the C.R.T. The V.D.R. unit is mounted parallel to the timebase printed panel, and immediately to the right of it.

2. The line output transformer is slightly smaller than in the 700 Series and is mounted immediately behind the timebase printed panel, with the E.H.T. tripler unit at its rear.

3. The shift controls are now on the bracket of P10 and are accessible when the decoder panel is hinged away from the chassis.

4. The plugs and sockets of the receiver have the same designations and uses as in the 700 Series, but some of them are in different positions.

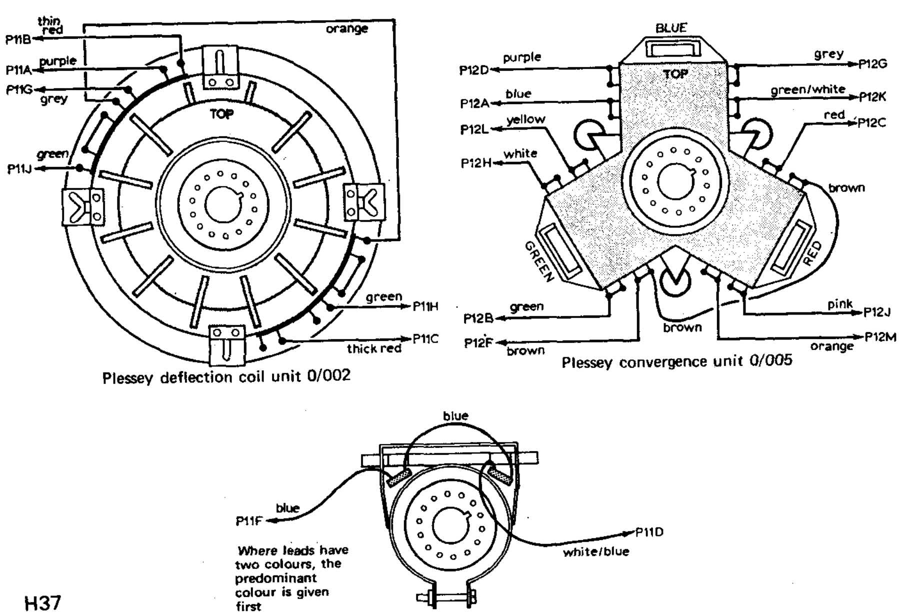
5. The chassis of the 710 Series may be placed in a hinged-out position (the "servicing" position) in the same way as the 700 Series chassis. However, when replacing the chassis in the cabinet, care should be taken to avoid trapping the wires of P11 and P12 between the chassis and the cabinet.

6. The convergence panel has a different shape from that of the 700 Series in that the top left-hand corner is cut at an angle—that section of the board was used for the focus circuit in the 700 Series. The panel is now easily removable to facilitate the convergence adjustments. The system switch of the panel should be disconnected from its actuating mechanism by undoing the linkage

between the switch and the bell crank. The panel should then be freed from the clip at its bottom left-hand corner when it will be free to be withdrawn from the locating studs at its right-hand edge. It can then be turned round (through 180 degrees) and lowered on to the bracket provided on the edge of the cabinet so that the controls face forward and are easily accessible from the front of the receiver. When the convergence panel is in the hinged-out position, the system switch on the panel must be operated by hand when the station selector knob is moved from 405-line operation to 625-line operation, and vice versa.

7. A beam current limiting circuit is fitted and the components are: C481, R498, C482, D44, R499, C483 and R500. C481 is in the tripler unit and a lead is fed to R498, C482, D44 and R499 which are mounted, with C483, on a tag-strip adjacent to the frame output transformer T400. A wire from the junction of R499 and C483 is fed to R500 which is mounted on the back of the I.F. printed panel.

8. The V.H.F. tuner used in the 710 Series is the same as that in the 700 Series, but the U.H.F. tuner is a push-botton type. Each of the four buttons may be tuned over the whole of Bands IV and V and drift of tuning is prevented by an automatic frequency control (A.F.C.) circuit. The tuner and control panel assembly is mounted in the cabinet by two brass studs and the studs have insulating sleeving on the section nearest the front of the cabinet. Removal and replacement of the assembly is carried out in a manner similar to that used for the 700 Series, except for the different mounting method and lack of tuning



(H37) THE CONNECTIONS OF THE DEFLECTION COILS, CONVERGENCE ASSEMBLY, AND BLUE LATERAL MAGNET—ALL VIEWED FROM REAR OF C.R.T. (BAIRD 710 SERIES)

and dial knobs on the U.H.F. tuner. The push-buttons of the U.H.F. tuner remain attached to their spindles when the unit is taken out of the cabinet—they should not be removed when the other control knobs are taken off. When replacing the tuner and control panel assembly in the cabinet, offer the spindles and push-buttons carefully to the holes in the cabinet. Also, make sure that the insulating sleeving is present on the mounting studs.

9. The A.F.C. circuit required by the push-button U.H.F. tuner is mounted on a small printed panel positioned above the I.F. printed panel, and slightly behind it.

10. The Plessey convergence and deflection coils are mounted differently from the Mullard components used in the 700 Series. The assembly is a tight fit on the neck of the C.R.T. and features a plastic sleeve which extends beyond the convergence coils, towards the base of the C.R.T. The blue lateral magnet assembly is positioned on the sleeve and when its locking screw is tightened, the complete assembly of blue lateral magnet, convergence coils, and deflection coils, is locked on to the neck of the tube.

11. The line output transformer is mounted immediately behind the time-base printed panel, with the E.H.T. tripler units at its rear, above the frame output transformer.

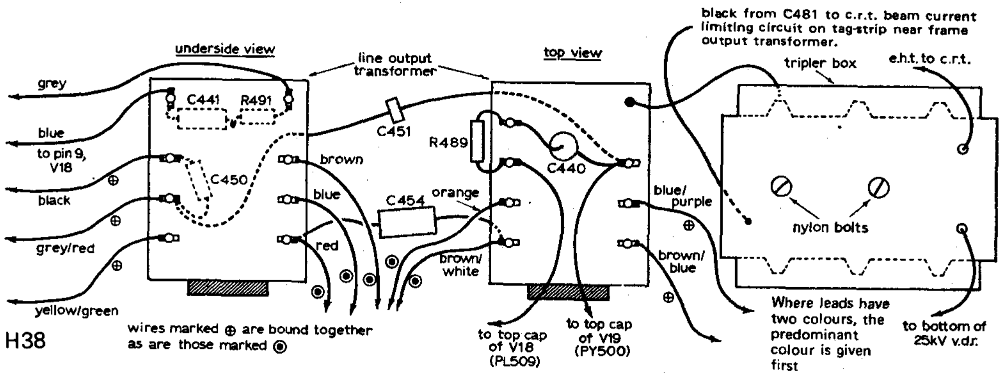
Electrical Adjustments:

1. Most of the electrical adjustments of the 710 Series should be made using the information on the 700 Series. The new and different adjustments are described below.

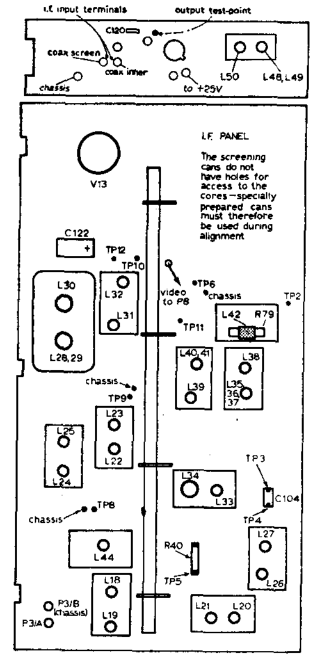
2. The adjustment procedures entail connecting items such as signal generators and an oscilloscope to the working receiver. It is therefore advisable to feed the mains supply to the receiver via a 350W mains isolation transformer constructed to B.S. If such a transformer is not available, make absolutely sure that the neutral wire of the supply is the one connected to the chassis of the receiver. Furthermore, if any of the external equipment has an earth connection as part of its mains wiring, that connection should be broken to prevent a bond between mains neutral and earth from being created when the equipment is connected to the receiver. The fact that the earth connection has been broken should be recorded on a label tied to the instrument concerned. When carrying out adjustments, make sure that the receiver and the equipment to be used are standing on an insulated surface.

3. Each of the four push-buttons on the U.H.F. tuner may be tuned over the whole of Bands IV and V. Tuning is simply accomplished: first depress the button concerned and then disable the A.F.C. circuitry by shorting TP9 to its adjacent chassis pin. Turn the push-button until the desired station is tuned in correctly (the buttons have been made quite difficult to rotate so as to prevent accidental movement). Clockwise movement of the buttons will move the tuning point towards the H.F. end of the range—towards the higher channel numbers. After tuning in the required stations, remove the shorting link from TP9.

4. *Line Oscillator.* Set the line hold control R477 to the centre of its range



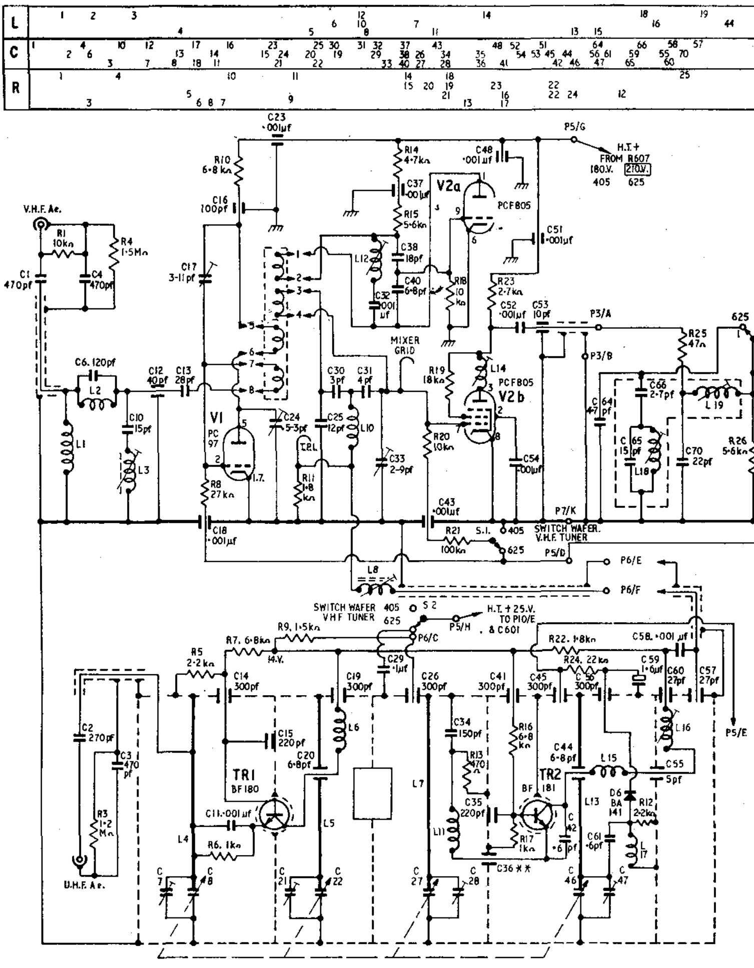
H38



H39

Above: (H38) The Connections of the Line Output Transformer and E.H.T. Tripler (Baird 710 Series)

Right: (H39) The Locations of the Test Points and Cores of the I.F. and A.F.C. Panels—Component Side (Baird 710 Series)

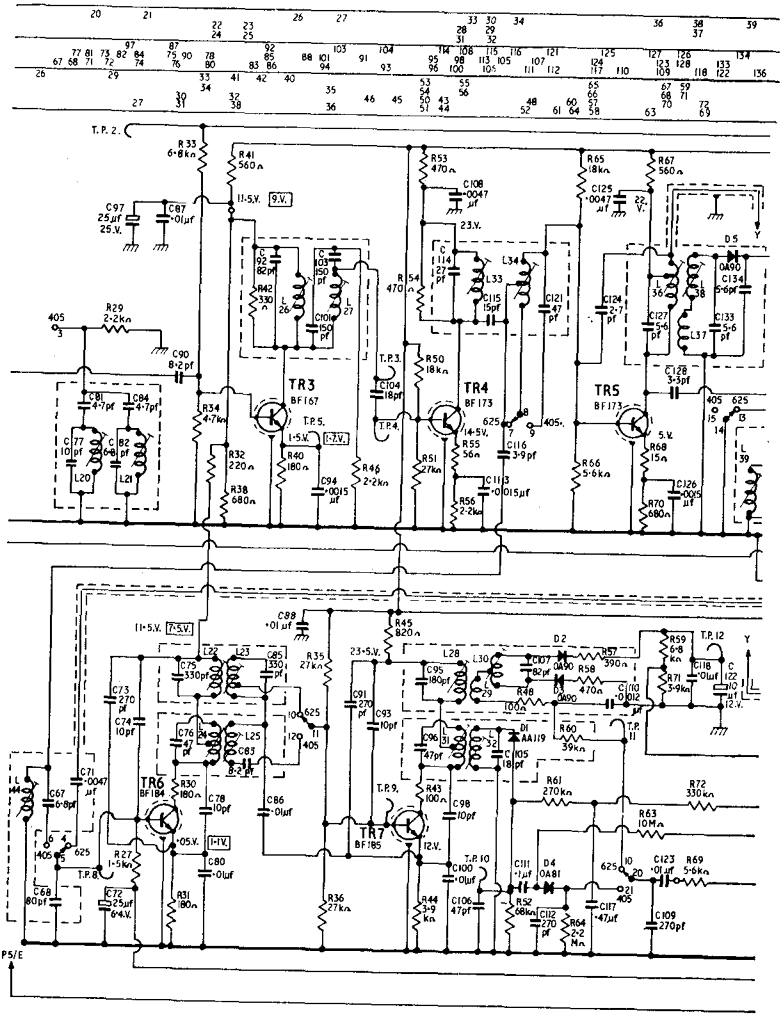


H40a

(H40a) Circuit Diagram—Vision and Sound P.V.S.5—A.F.C. P.F.C. 1/3 (Baird 710 Series) (Part)

and fit a shorting link from TP30 to its adjacent chassic pin. Switch the receiver to 625 and adjust L433 until the picture is resolved and running through in a horizontal direction. Switch to 405 and adjust C424 also to obtain a resolved picture running through in a horizontal direction. Then, remove the shorting link from TP30.

5. The focus is adjusted by turning the knurled red ring on the 25kV V.D.R. unit, which is located immediately to the right of the timebase panel.

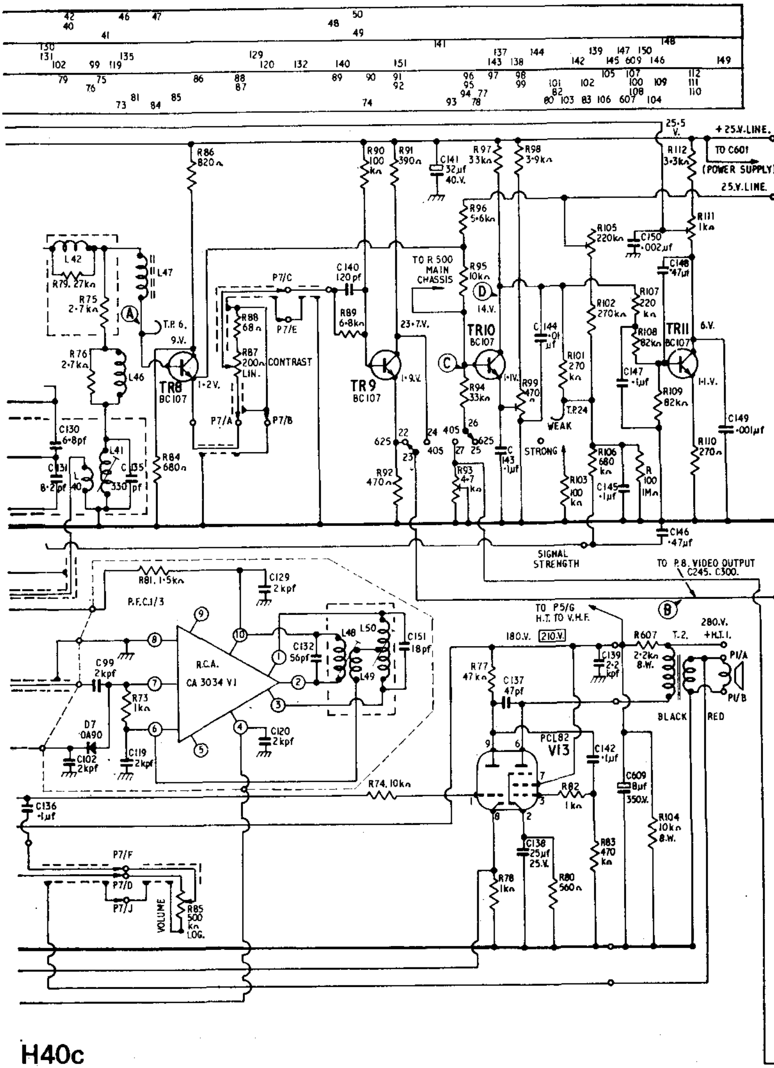


H40b

(H40b) Circuit Diagram—Vision and Sound P.V.S.5—A.F.C. P.F.C. 1/3 (Baird 710 Series) (Part)

6. The shift controls are now mounted on the bracket carrying P10, instead of on the power supply panel. The controls are reached in the same manner as in the 700 Series—by hinging out the decoder panel.

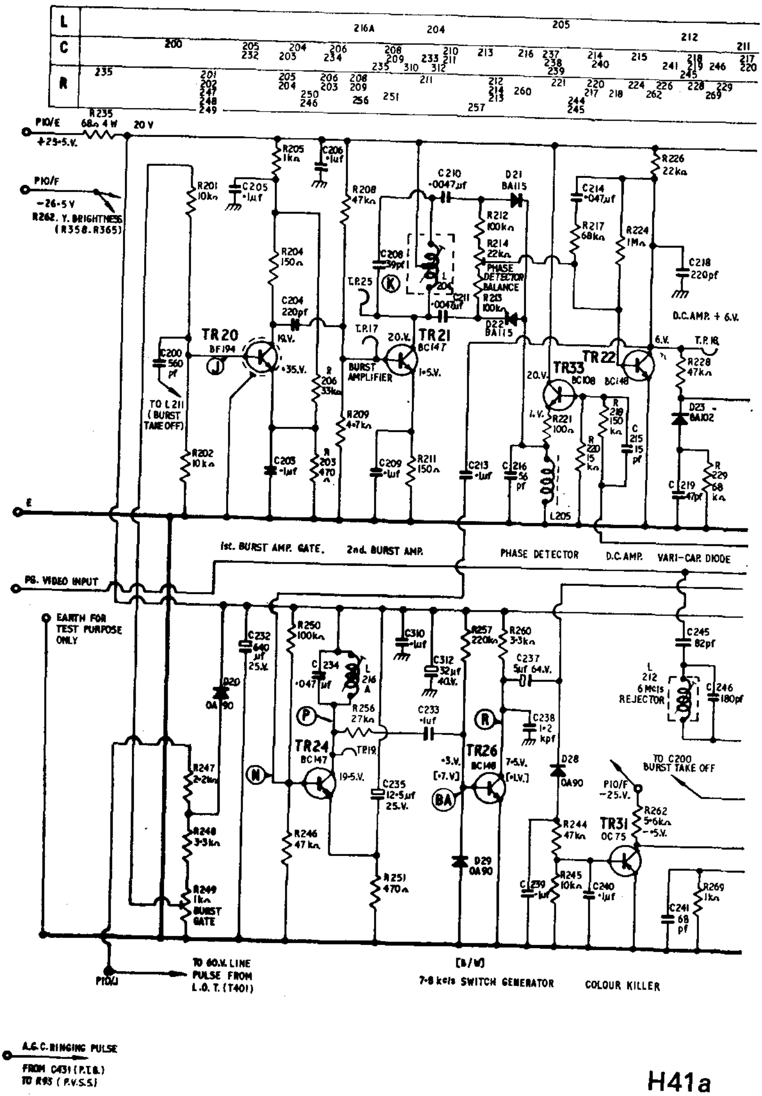
7. Installation of a receiver should be carried out in accordance with the information contained in the Installation Instruction Booklet packed with each set, although the information on the 700 Series should be noted too. As mentioned earlier the convergence panel of the 710 Series may be hinged out to



H40c

(H40c) Circuit Diagram—Vision and Sound P.V.S.5—A.F.C. P.F.C. 1/3 (Baird 710 Series) (Continued)

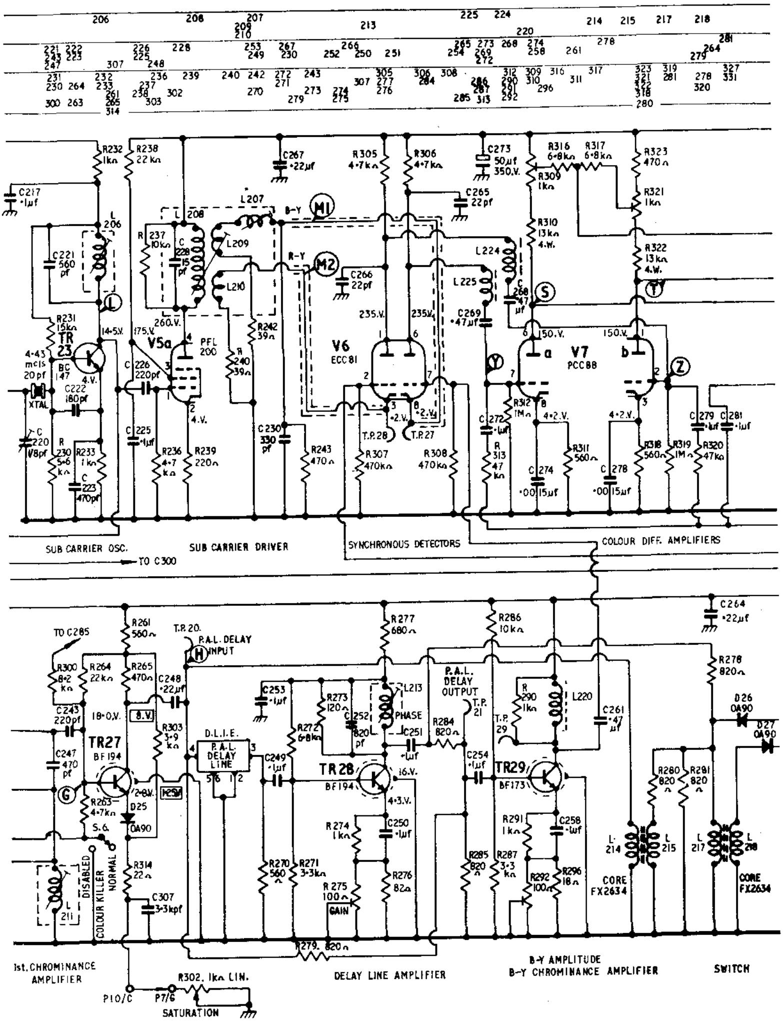
facilitate adjustments. If receiver features background connection pins on the convergence panel, disconnect all three pins before examing purity and check that the screen is blacked out. Reconnect pins as required for checks of purity of individual colours, or for overall checks. (Since removable sockets remain live, care should be taken that the insulating sleeving is always in place, and that only one hand is used when making a disconnection or reconnection.) When procedure calls for a background to be turned to minimum—as during convergence



(H41a) CIRCUIT DIAGRAM—DECODER P.D. 3/9 (BAIRD 710 SERIES) (PART)

—appropriate pin may be disconnected instead. This has the advantage of allowing three background controls to be left at their correct settings.

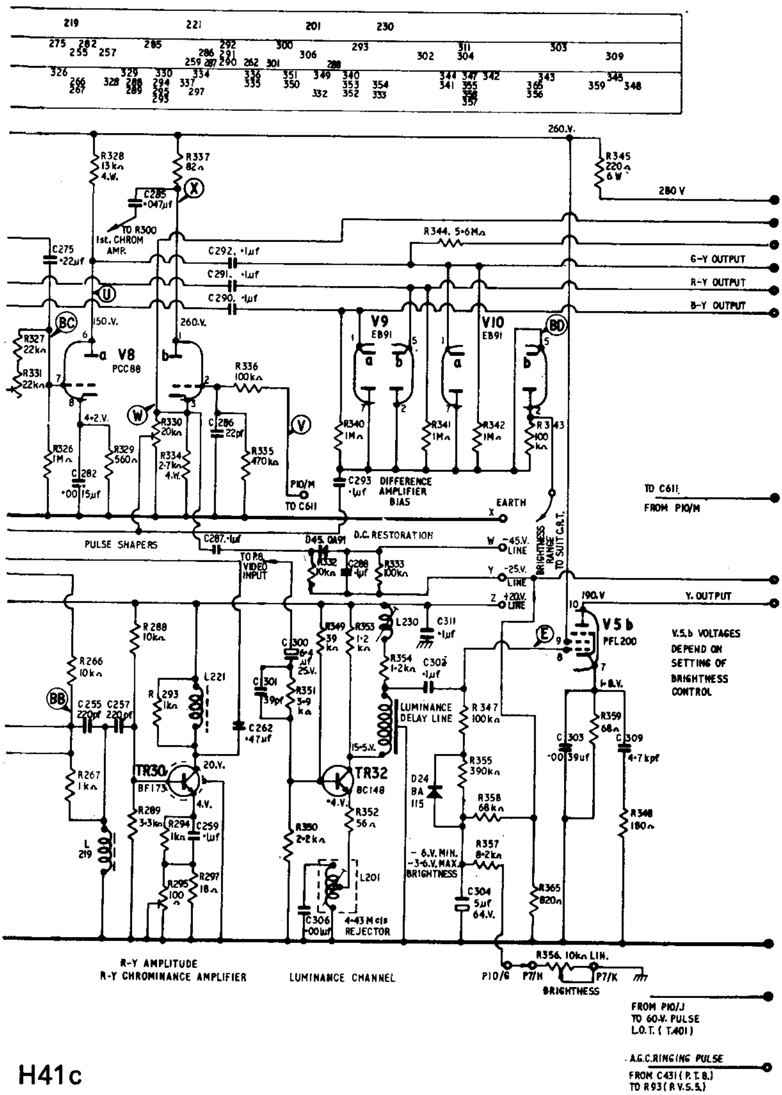
8. The width and line linearity controls are set in the manner described for the 700 Series but the references to "Line Tuning" should be disregarded. The E.H.T. potential is set up on 625 and 405 as described for the 700 Series,



(H41b) Circuit Diagram—Decoder P.D. 3/9 (Baird 710 Series) (Part)

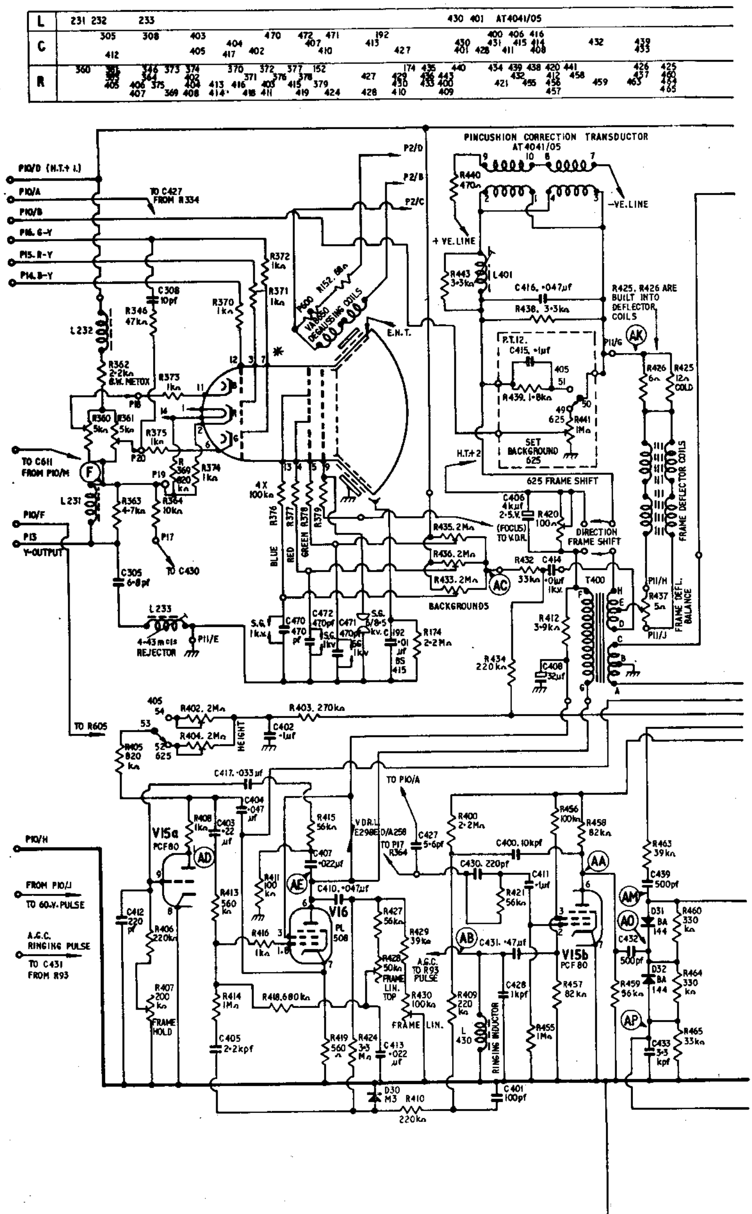
using R484 and R485, but the references to V22, R513 and R496 should be ignored. The A.G.C. circuitry may be adjusted as described for the 700 Series.

A.F.C. Circuit: When the circuit needs very little alteration—the following sequence of adjustments should be made. A voltmeter with a sensitivity of 20,000 ohms per volt, and a 4 in. shorting link will be required. Connect the meter, on its 10V D.C. range, between chassis and the output test-point on the A.F.C. panel. Short circuit TP9 on the I.F. panel to the adjacent chassis



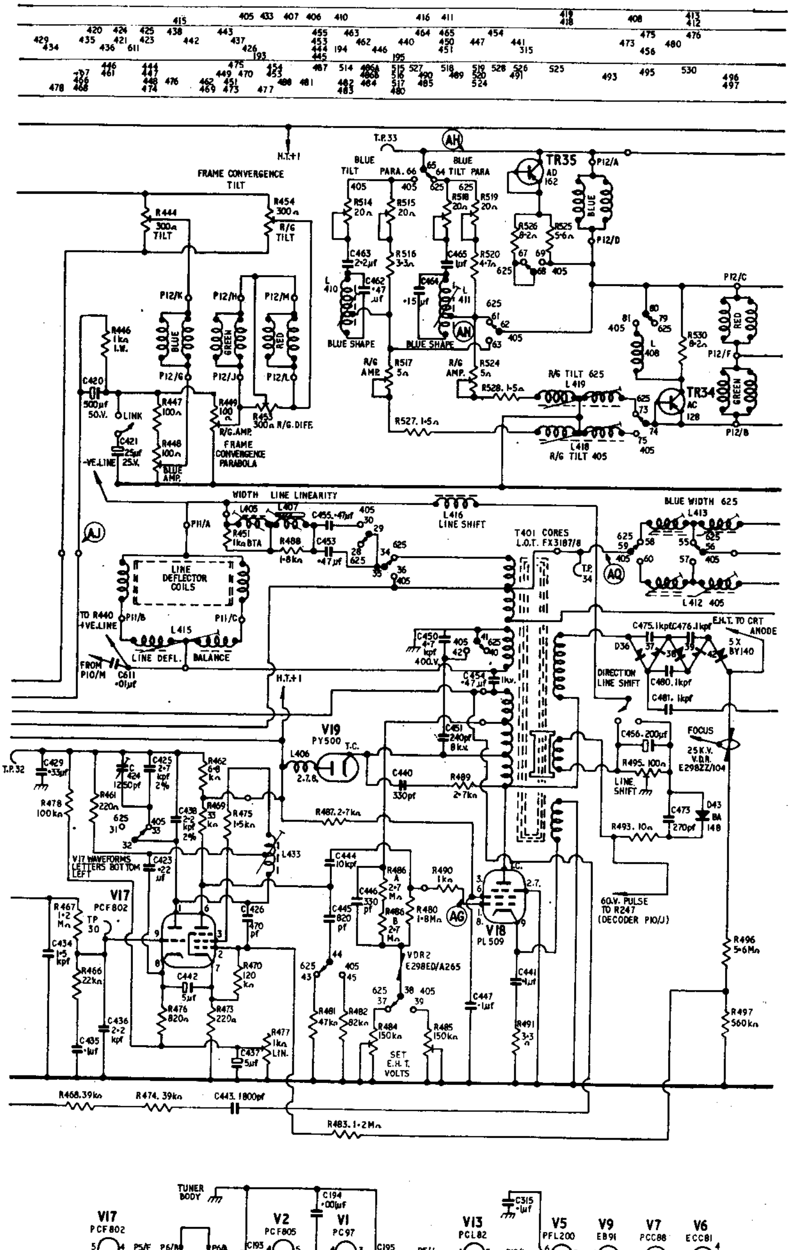
(H41c) Circuit Diagram—Decoder P.D. 3/9 (Baird 710 Series) (Continued)

pin. This removes the sound I.F. input from the base of Tr7 and therefore cuts off the A.F.C. network. Tune the receiver to a 625-line U.H.F. colour transmission and very carefully adjust the manual tuning to the correct point. Note the reading on the meter. Remove the short from TP9 to restore A.F.C. Then adjust the secondary core, L50, of the A.F.C. phase-shift transformer so

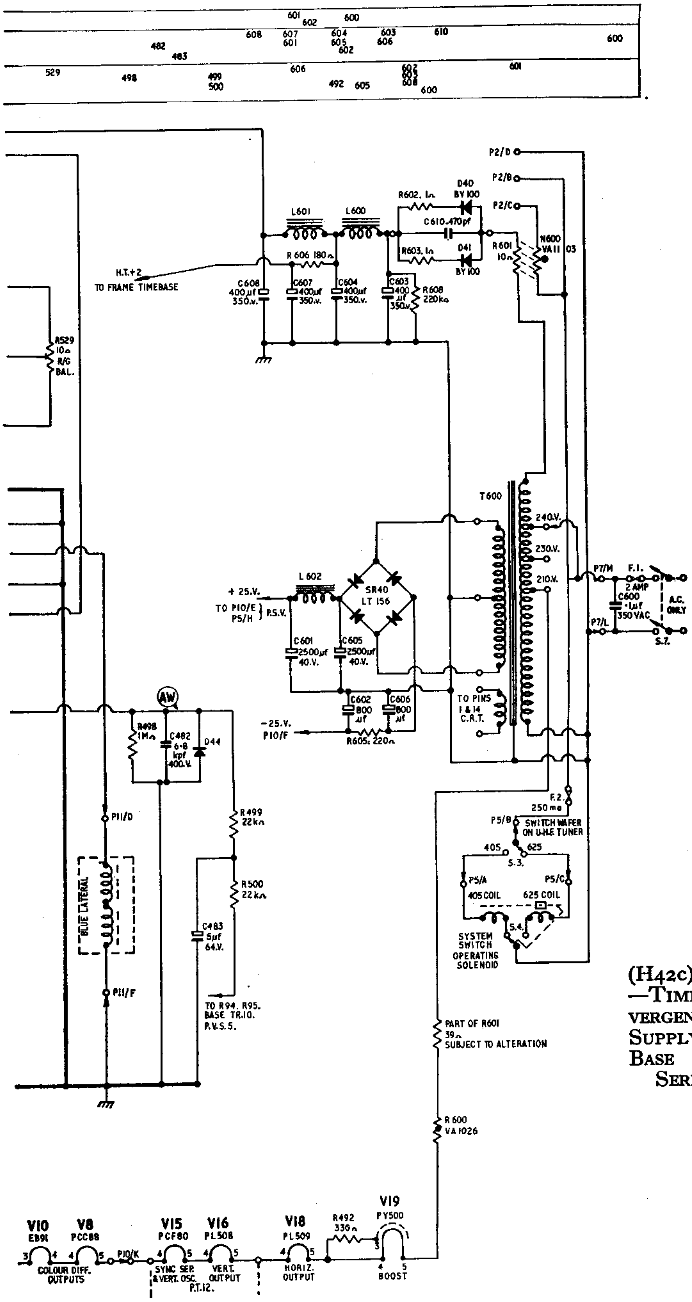


H42a

(H42a and H42b) Circuit Diagrams (H42b opposite)—Timebase P.T.12—Convergence P.C.4/4—Power Supply P.S.U.2—Tube Base P.B.1 (Baird 710 Series)


FRAME CONVERGENCE TILT
R444 300Ω TILT
R454 300Ω R/G TILT
BLUE TILT
BLUE PARA. 66
BLUE 64 TILT PARA
TR35 AD 162
BLUE SHAPE
R/G AMP.
R/G TILT 625 L419
L418 R/G TILT 405
TR34 AC 128
RED
GREEN
BLUE
R446 1kΩ L.W.
C420 500µf 50.V.
LINK
C421 25µf 25.V.
-VE.LINE
R447 100Ω
R448 100Ω
BLUE AMP.
R449 100Ω
R/G.AMP.
FRAME CONVERGENCE PARABOLA
R453 300Ω R/G. DIFF.
WIDTH
LINE LINEARITY
L416 LINE SHIFT
R451 1kΩ BTA
R488 1·8kΩ
T401 CORES L.O.T. FX3187/8
BLUE WIDTH 625
L413
L412 405
LINE DEFLECTOR COILS
TO R440 +VE.LINE
L415
LINE DEFL.
BALANCE
FROM P10/M
C611 ·01µf
H.T.+1
C475. 1kpf
C476. 1kpf
E.H.T. TO CRT ANODE
5X BY140
DIRECTION LINE SHIFT
C480. 1kpf
C481. 1kpf
C456. 200µf
FOCUS
25K.V. V.D.R. E298ZZ/104
R495. 100Ω
LINE SHIFT
C473 270pf
D43 BA 148
R493. 10Ω
V19 PY500
L406 2.7.8.
C440 330pf
R489 2·7kΩ
R487. 2·7kΩ
T.P.32
C429 ·33µf
R478 100kΩ
R461 220Ω
C424 1250pf
C425 2·7 kpf 2%
R462 6·8 kΩ
C438 2·2 kpf 2%
R469 33 kΩ
R475 1·5kΩ
L433
V17 WAVEFORMS LETTERS BOTTOM LEFT
C423 ·22 µf
V17 PCF802
R467 1·2 MΩ
TP 30
C434 1·5 kpf
R466 22kΩ
C436 2·2 kpf
C435 ·1µf
C442 5µf
R476 820Ω
R473 220Ω
R470 120 kΩ
C426 470 pf
R477 1kΩ LIN.
C437 5µf
C444 10kpf
C446 330 pf
C445 820 pf
R486 A 2·7 MΩ
R486 B 2·7 MΩ
R490 1kΩ
R480 1·8MΩ
VDR2 E298ED/A265
R481 47kΩ
R482 82kΩ
R484 150kΩ
R485 150kΩ
SET E.H.T. VOLTS
C447 ·1µf
V18 PL509
C441 ·1µf
R491 3·3 Ω
60.V. PULSE TO R247 (DECODER P10/J)
R496 5·6MΩ
R497 560kΩ
R468. 39kΩ
R474. 39kΩ
C443. 1800pf
R483. 1·2MΩ
TUNER BODY
C194 ·001µf
C315 ·1µf
V17 PCF802 HORIZ. OSC. P.T.12.
U.H.F. TUNER
V2 PCF805 OSC/ MIXER V.H.F. TUNER
C193 ·001µf
V1 PC97 R.F.
C195 ·001µf
V13 PCL82 SOUND OUTPUT P.V.S.5.
V5 PFL200 LUMINANCE AMP.
V9 EB91
V7 PCC88 COLOUR DIFF. OUTPUTS
V6 ECC81 DEMOD.
P.D.3.

H42b



(H42c) Circuit Diagram—Timebase P.T.12—Convergence P.C.4/4—Power Supply P.S.U.2—Tube Base P.B.1 (Baird 710 Series) (Continued)

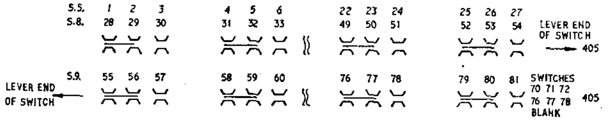
that the noted reading is restored on the meter. If the correct tuning position has been located, the reading on the meter will increase and decrease if the core of L50 is "rocked".

Circuit Diagram Notes:

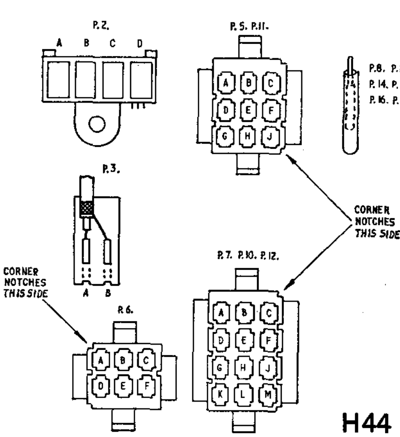
1. All voltage measurements taken with AVO Model 8.
2. Encircled letters refer to waveforms.
3. The voltages on TR8, TR9, TR10 and TR11 are only approximate because they depend on the type of signal present. The voltages given on the diagram were taken with the contrast control at maximum.
4. Where two voltages are shown, the first voltage is for 405 operation, and the second (in box) is for 625 operation.
5. Decoder voltages are measured with a colour signal input. On a black-and-white signal, TR31 and hence TR27 are cut off.
6. TR27 voltages are given for minimum and maximum (in box) saturation control settings.
7. The potential on C.R.T. grids is 40 V, 60 V, 85 V or 105 V depending on D.C. restorer tapping.
8. C36 is a lead through insulator, the capacity of which is less than 1 pF.

Switch Details:

1. S4 mechanically linked to solenoid.
2. Wafer switches S1, S2 and S3 are mounted at rear of V.H.F. tuner.
3. S4 is mounted on chassis above PVS5.
4. S6 is mounted at bottom of PD3.
5. S7 is on front panel.



H43

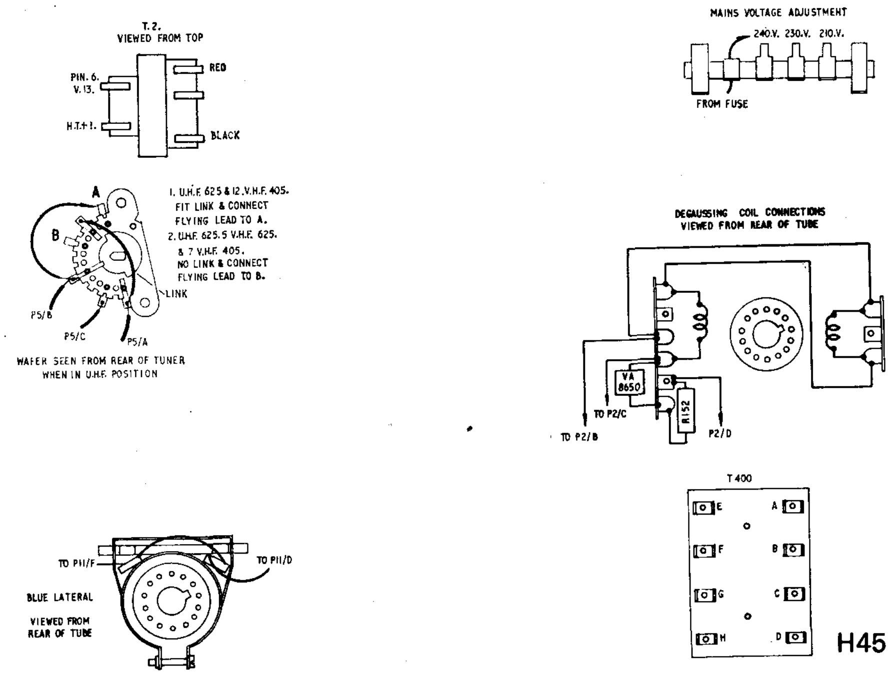


H44

Above: (H43) System Switch Details
Right: (H44) Plugs and Sockets—Sockets Viewed From Open Ends (Baird 710 Series)

System Switch Details:

1. All system switches mechanically linked to solenoid.
2. All switches shown in 625 position.
3. S5 (1 to 27) mounted on PVS5.
4. S8 (28 to 54) mounted on PT12.
5. S9 (55 to 81) mounted on PC4.



(H45) Components Details (Baird 710 Series)

Socket Location: P1: T2 sound output transformer, double. P2: T600 mains transformer, 4 way. P3: bottom of PVS5, double. P4–P5: mounted on V.H.F. tuner, 9 way. P6: on leads between V.H.F. and U.H.F. tuners, 6 way. P7: mounted on V.H.F. tuner, 12 way. P8: on PD3 flying lead to PVS5, single. P9–P10: on bracket at rear of PD3 panel, 12 way. P11: on convergence panel bracket, 9 way. P12: on convergence panel bracket, 12 way. P13: adjacent to V5 on PD3 panel, single. P14: adjacent to V9a on PD3 panel, single. P15: adjacent to V9b on PD3 panel, single. P16: adjacent to V10a on PD3 panel, single. P17: adjacent to L233 on C.R.T. base assembly, single. P18: adjacent to pin 11 on C.R.T. base assembly, single. P19: adjacent to pin 2 on C.R.T. base assembly, single. P20: adjacent to pin 6 on C.R.T. base assembly, single.

Socket Connections: P2: A, blank. B, degaussing coil. C, degaussing coil N600. D, degaussing coil P600. P3: A, V.H.F. tuner I.F. coax. B, V.H.F.

tuner I.F. screen. P5: A, S3/405 coil. B, S3 fuse 2. C, S3 625 coil. D, junction S1, C146, R106. E, PFC1 to U.H.F. tuner. F, V17, P6/B heater. G, C48, R607 H.T. H, S2 +25V. J, V13, C195 heater. P6: A and B, link heater chain. C, S2, R22 +25V. D, blank. E, U.H.F. output to V.H.F. tuner screen. F, U.H.F. output to V.H.F. tuner coax. P7: A, TR8 emitter R87 coax. B, TR8 emitter R87 screen. C, junction R87, C140, R89. D, R85, R69. E, screen of P7/C. F, C136, R85. G, R302, P10/C. H, R356, P10/G. J, screen for P7/D, P7/F. K, R356 chassis. L, mains neutral T600. M, mains live T600. P8: video output Tr9, C245, C300. P10: A, R330, R334, V8b. B, R441, R344. C, R314, P7/G. D, R345, H.T. +1. E, R235 +25V. F, R358, R365 −25V. G, R357, P7/H. H, chassis PD3. J, R247, T401. K, V8, V15 heater chain. L, V5, V13 heater chain. M, R336, C611. P11: A, to L405, L416. B, L415 line deflection coils. C, L415. D, switch 56 blue lateral. E, chassis. F, chassis blue lateral. G, C416, R438, R426, R425. H, R437. J, R437. P12: A, TR35 switch 65. B, R529, TR34, switch 74. C, P12/D, R529, switches 62, 67, 68, 80. D, P12/C, switches 62, 67, 68, 80. E, blank. F, R529 balance. G, slider R448, blue convergence coil. H, P12/M, R453, R/G diff. J, R449, R/G amp, R453, R/G diff. K, slider R444, blue convergence coil. L, R453, R/G diff., R454, R/G tilt. M, P12/H, R453, R/G diff. P13: V5b pin 10, C305. P14: V9a pin 1, C.R.T. pin 12. P15: V9b pin 5, C.R.T. pin 3. P16: V10a pin 1, C.R.T. pin 7. P17: C430, R364. P18: slider R360, C.R.T. pin 11. P19: R360, R361, R364, C.R.T. pin 2. P20: slider R361, C.R.T. pin 6.

Circuit Modifications:

1. The connections of P12/J and P12/L are shown incorrectly. P12/J should go to R453 (R/G diff.) and R454 (R/G tilt). P12/L should go to R449 (R/G amp) and R453 (R/G diff.).
2. R79 is 5·6k and not 27k.
3. D44 is type IN4004 (Texas).
4. C.R.T. is type A49–15X.
5. TR30 may be BF173 or BF167.

B.R.C. 2000 Series

General Description: This range of receivers is covered in the 1968–69 volume. Here, some extra information is given from the workshop servicing manual.

I.F. Amplifier: The following differences from the circuit diagram may be found on some boards: C113 and C114 not fitted, a capacitor (42 or 62pF) across R16, a 1k resistor across L25, W11 and W12 may be Y728 or BA130.

Video Amplifier: Two types of board may be found in service: Type 135 and Type 235. The identifying number is printed on the component side of the board adjacent to the extractor tab and is also etched on the copper side. Basically the two types are similar but separate circuit diagrams and component locations are provided for ease of servicing. Although generally all modules are fully interchangeable, video boards of the 235 type (i.e. above serial number 13,000) cannot be used with line timebase boards below serial number 12,000 unless a small modification is made to the line timebase board. Should any doubt exist regarding compatibility when dispatching a video board Type 235 as a replacement, it is advisable to provide also a 150k, 10 per cent, $\frac{1}{4}$W resistor for fitting across C18 on the line timebase board in case this should be required. The need for fitting the resistor will be seen as a loss of colour on the extreme right-hand side of the picture.

Interconnection Details (Video Type 235):

EC8

1. I.F. board EC9/11
2. Power regulator EC11/8
3. Tint control
4. Line timebase EC5/10
5. Tint control
6. Junction block EC3/4
7. Not used
8. Not used
9. Brightness potential from convergence EC2C/8 (video reference line with set white switch operated)
10. Line timebase EC5/18 via sync. switch on 625 horizontal hold control
11. Frame timebase and sound EC6/4
12. Power regulator EC11/16
13. Chrominance EC7/3—
    Bias in for 4·4 MHz rejector switch
14. Chassis earth

PLG7—pins on board

1. Luminance in from I.F. board SKT7
2. Luminance in from I.F. board SKT7

PLG8—pins on board

1. Green
2. Red
3. Blue

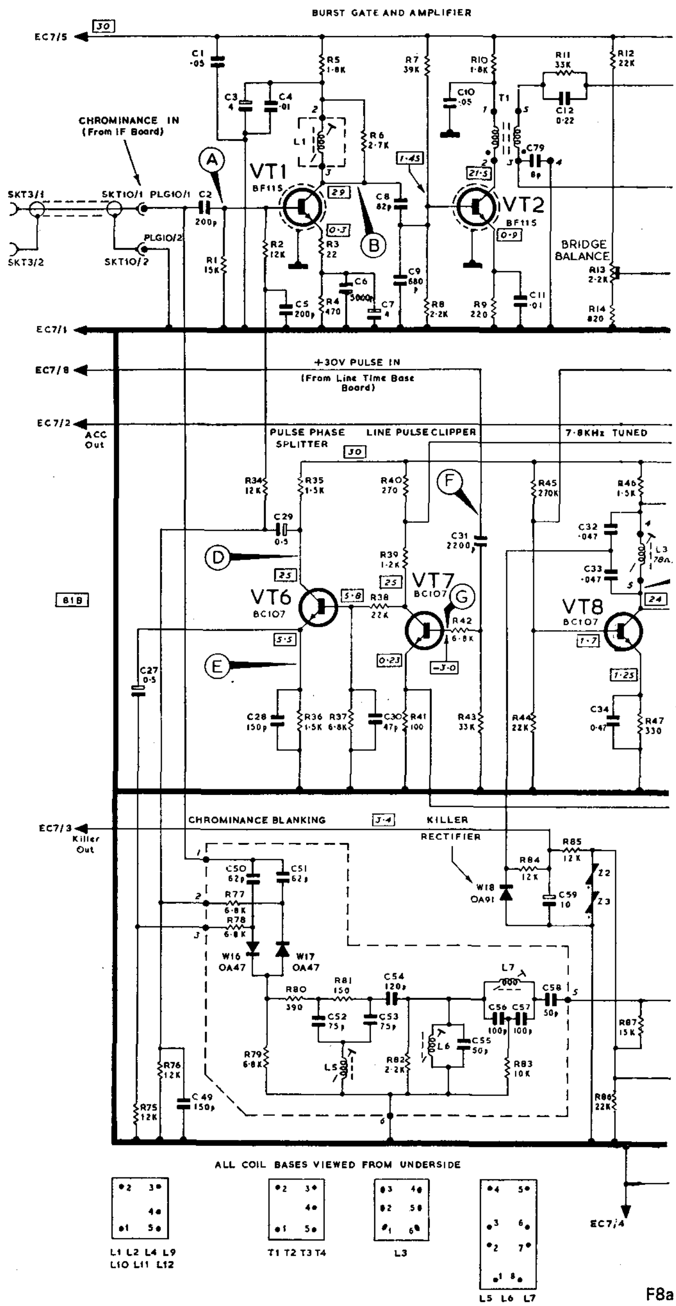
} Composite signals to C.R.T. cathodes via SKT8 and spark protection board

SKT9—on flying leads

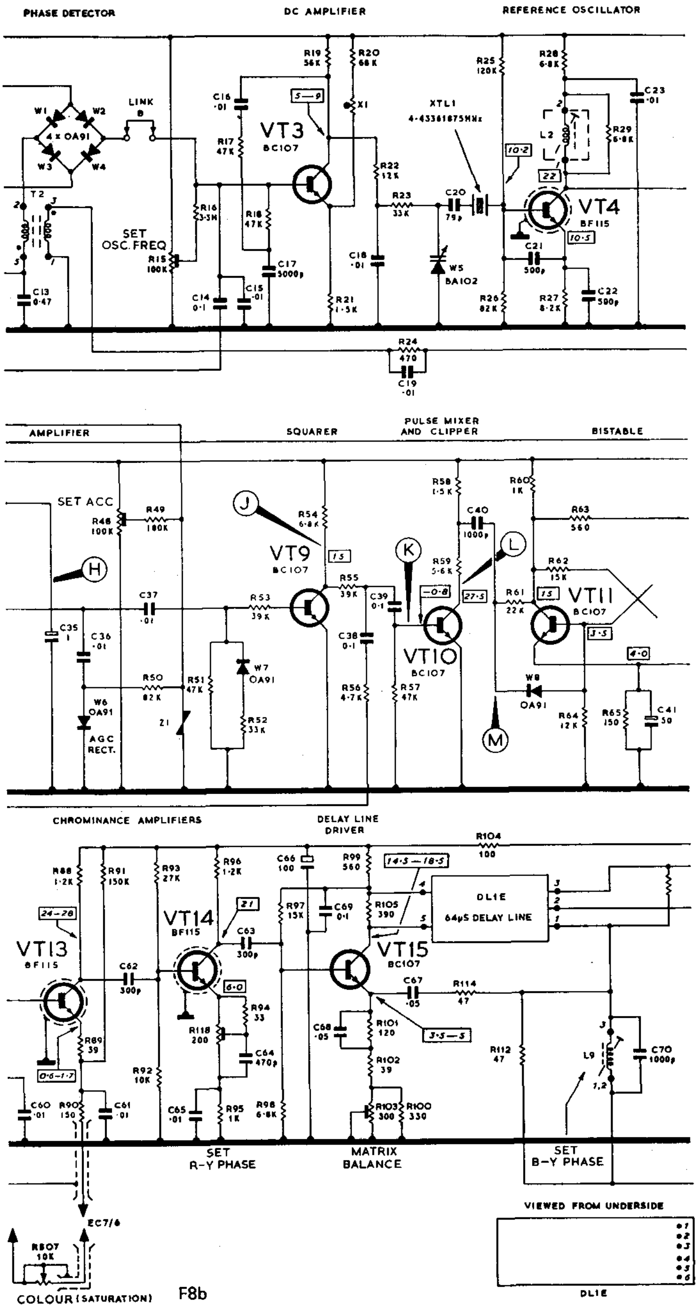
1. R–Y in from chrominance
2. Earth for R–Y and B–Y inputs
3. A.C. return for colour difference inputs
4. B–Y from chrominance

Video Type 135: This type is described in the 1968–69 volume. The following differences from the circuit diagram may be found on some boards:

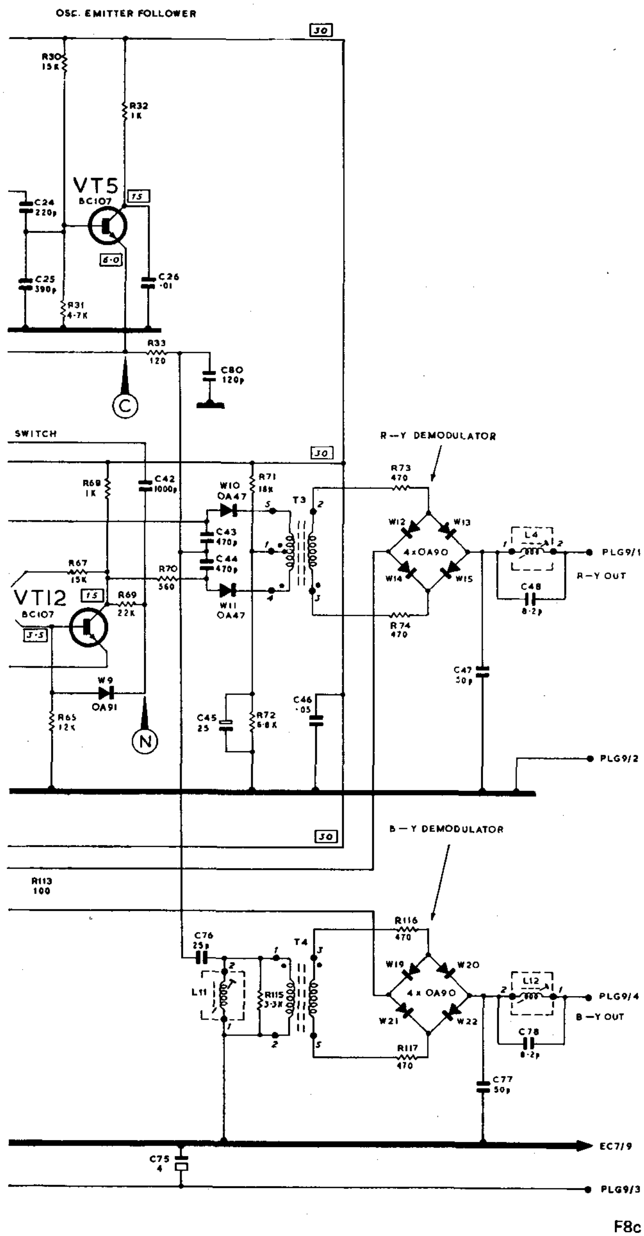
1. C14 may be 30 or 68pF.
2. R29 may be 4·7k.
3. R34 may be 220 ohms.
4. R54 may be 1k.
5. A 1·5k resistor may be fitted in series with W1.



(F8a) CHROMINANCE TYPE 231 (B.R.C.2000 SERIES) (PART)

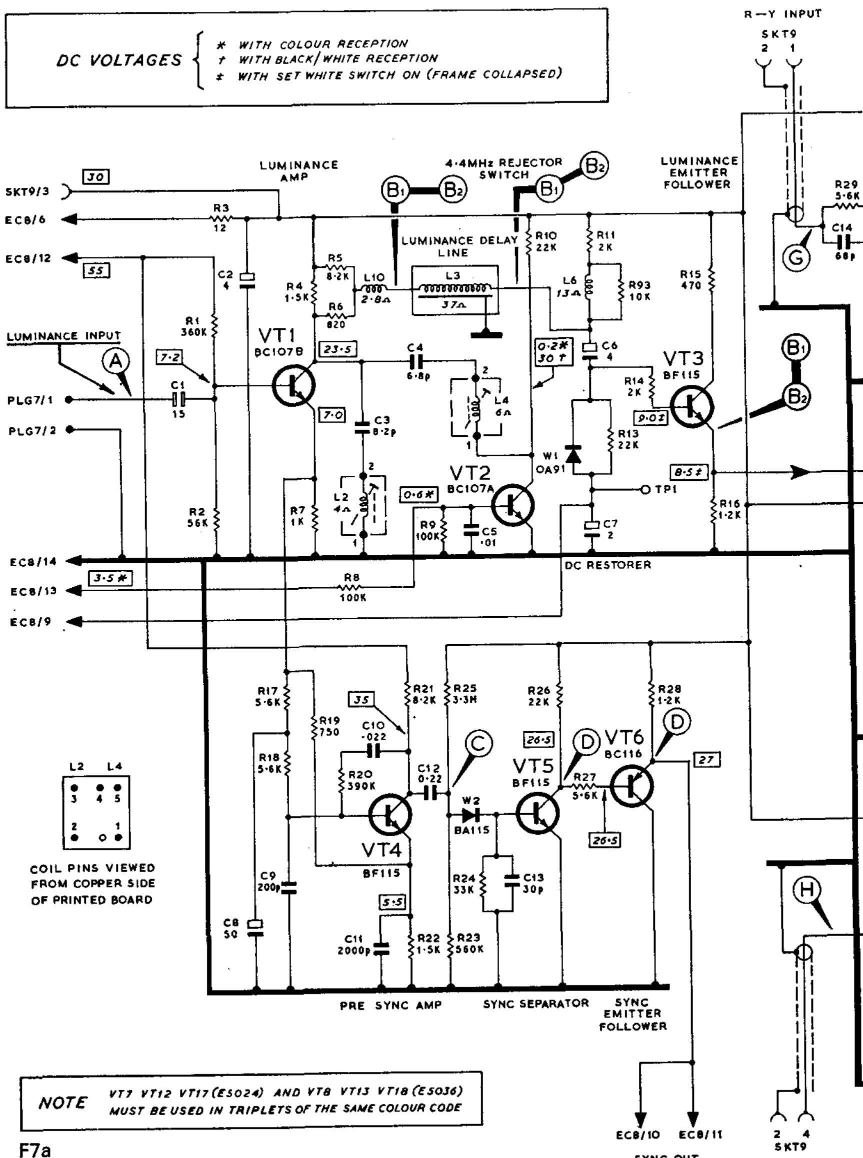


(F8b) CHROMINANCE TYPE 231 (B.R.C. 2000 SERIES) (PART)

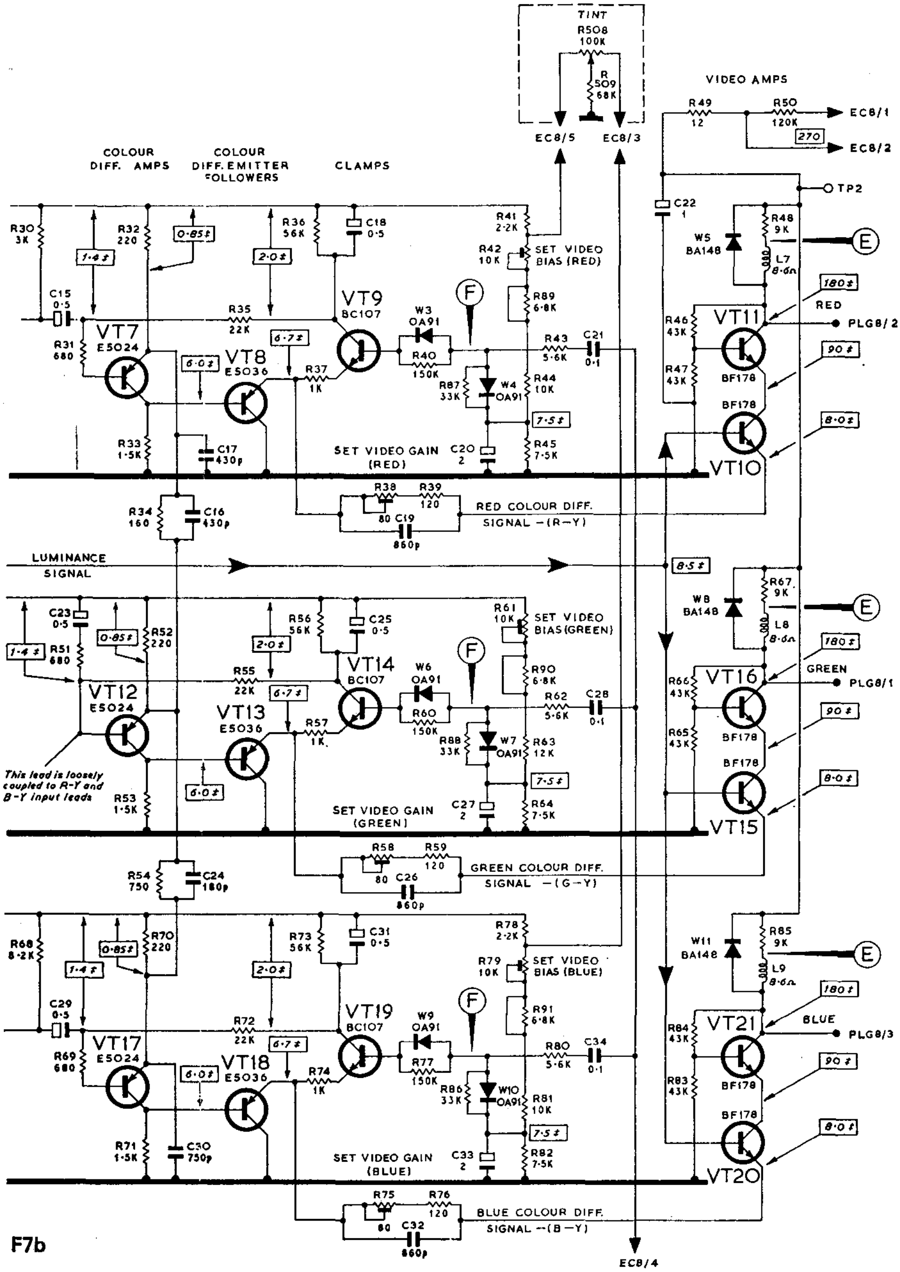


F8c

(F8c) Chrominance Type 231 (B.R.C. 2000 Series) (Continued)



(F7a) VIDEO TYPE 235 (B.R.C. 2000 SERIES) (PART)



F7b

(F7b) VIDEO TYPE 235 (B.R.C. 2000 SERIES) (CONTINUED)

6. VT2 may be type BC107.
7. VT7, VT12 and VT17 may be type 2N3702.
8. VT8, VT13 and VT18 may be type 2N4062.
9. W5, W8 and W11 may be type BA145.

Video Type 235: This type is described in this volume. The following differences from the circuit diagram may be found on some boards:

1. C3 and L2 may not be fitted.
2. C6 may be 2·2μF.
3. R13 may be 39 or 100k.
4. VT2 may be type BC183LA.
5. VT3 may be type BC183LB.
6. VT10, VT15 and VT20 may be type BF157 or BF257.
7. VT11, VT16 and VT21 may be type BF257.

Field Timebase and Sound: The following differences from the circuit diagram may be found on some boards:

1. C8 may be 2·2μF, polyester.
2. C23 may be 200pF.
3. C27 may not be fitted.
4. R9 may be 20k preset.
5. R10 may be 10k.
6. R11 may be a fixed resistor, value 12, 15 or 20 ohms.
7. R12 may be 15 ohms.
8. R17 may be 270 ohms.
9. R29 may be 22k.
10. R30 may be 1k preset.
11. R31 may be 1k.
12. VT2 may be BFY52.
13. W2 may be OA47.
14. W3 may be OA10.
15. W4 may be OA5.
16. W5 may be IN2070, BY130 or AC128 (diode connected transistor).

Line Timebase Note: Line timebase boards below serial number 12,000, although suitable for use with video boards type 135, will not be suitable for use with video boards type 235, unless they have been modified with a 150k, 10 per cent, $\frac{1}{4}$W resistor fitted across C18 (330pF) on the copper side of the line timebase board. The resistor is only necessary on boards where C19 is 2200pF.

Line Timebase Modifications: The following differences from the circuit diagram may be found on some boards:

1. C3 may be 680pF or 1000pF.
2. C18 may be 330pF.
3. C19 may be 3000pF or 2200pF, see line timebase notes in previous paragraphs.
4. C24 may be connected on the 625 pole of S1A with a similar capacitor on the 405 pole.
5. C32 and C33 may not be fitted.

6. R23 may be 60 ohms.
7. R24 may be 90 ohms.
8. R25 may be 100 ohms.
9. R27 may be 2·2k.
10. R28 may not be fitted.
11. VT4 and VT5 may be type D1418.
12. W1 and W2 may be type U14705, MSD6102 or IN4952.
13. W3 may be OA81.

E.H.T. Supply: The follow differences to the circuit diagram may be found on some boards:

1. C1 may be 50 μF.
2. C2 may be 150 μF.
3. C8 may be 150 μF.
4. C9 may be 22,000 pF.
5. C11 may not be fitted.
6. VT6 may be type 2S034.
7. VT7 may be type D1417.

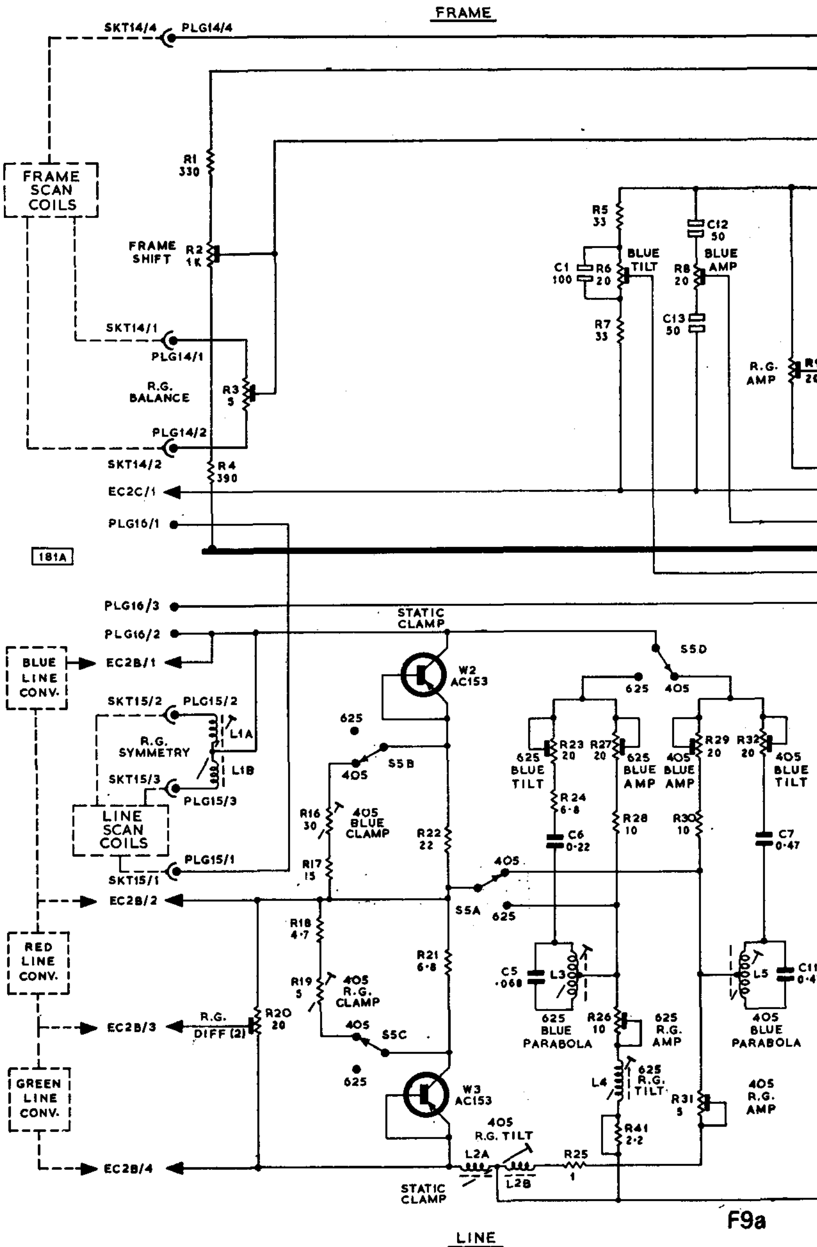
Power Supply Note: In a few early modules, emitter follower VT2 and associated components are not fitted. Instead, a 68V stabilised supply is taken directly from the Zener W15. Also, a magnetic delay switch is connected in series with the branch of this supply, which is connected to EC10/7. A thermistor connected in series with the delay switch operating coil provides a delay of approximately 15 seconds from switch on of the 68 V line to the power regulator board.

Power Supply Modifications: The following differences from the circuit diagram may be found on some boards:

1. C17 may not be fitted.
2. C18 may not be fitted.
3. R16, R17 and R18 may be 100 ohms.
4. R21 may be 5k or 3·5k.
5. R25 may not be fitted.
6. W1 to W4 may be type BY130 or IN2070.
7. W5 to W8 may be type BY126 or SM61.
8. W11 to W14 may be type BY130 or IN 2070.
9. W16 may be type BY130.
10. W505 may be type BY126 or IN2070.
11. Two 1 μF capacitors may be mounted on junction block and connected in series across the 240 V A.C. secondary supply with the centre point connected to chassis.

Power Supply Regulator Note: Some early boards are fitted with an additional "trip" circuit (similar to the line trip circuit) at the field regulator output. Also, in some boards microswitches are fitted to allow manual re-setting of the trip circuits.

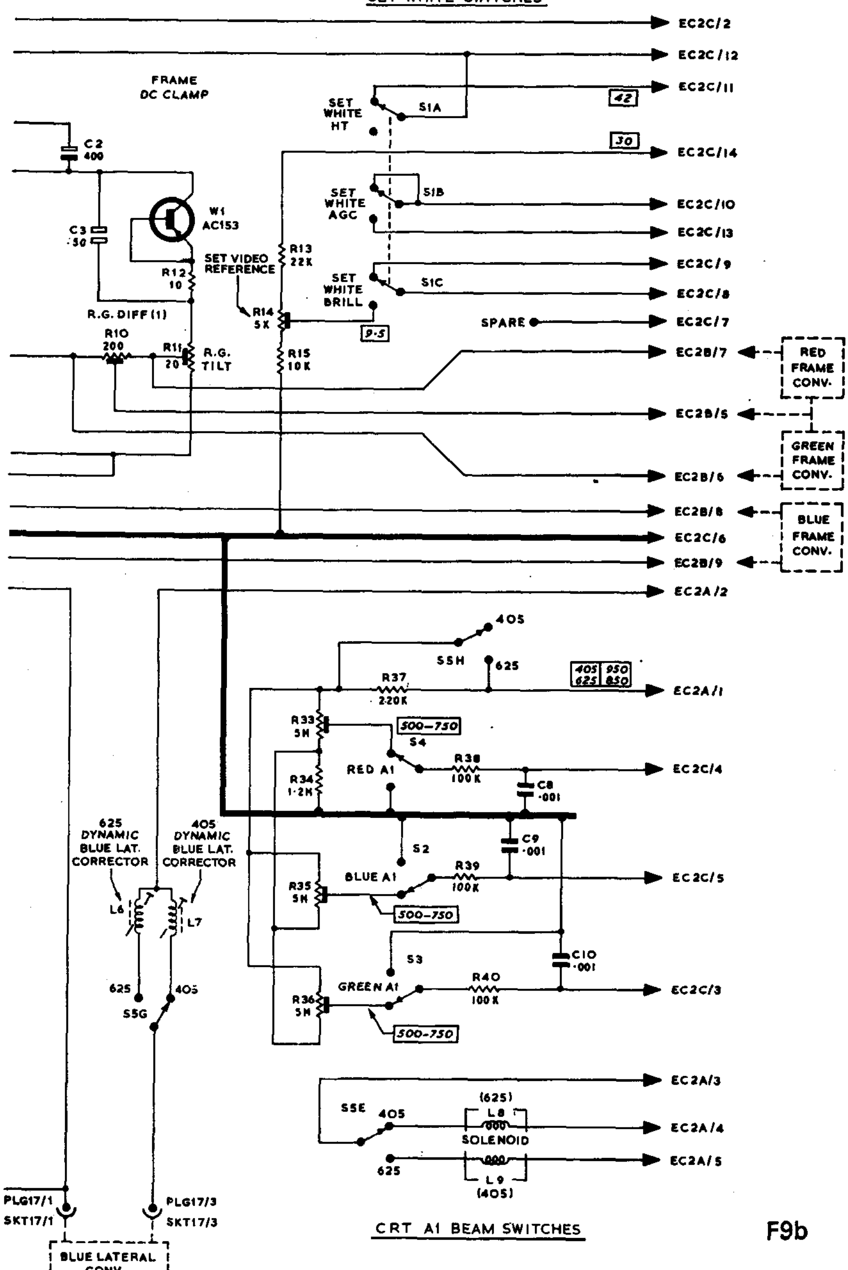
Power Supply Regulator Modifications: The following differences from the circuit diagram may be found on some boards:



F9a

(F9a and F9b opposite) Convergence Type 232 (B.R.C. 2000 Series)

SET WHITE SWITCHES



CRT A1 BEAM SWITCHES

F9b

1. R4 may be 120 ohms.
2. R5 may be 47k.
3. W3 may be type 1S2068A.
4. W4 may be type ZF8.2 or 1S2100 or ZF6.8.
5. W5 may not be fitted.

Chrominance: Two types of chrominance module will be found in service, type 131 and type 231, employing different delay line and matrix circuits. The two types are otherwise similar and are completely interchangeable. Type 231 was introduced after board serial number 16,000 (approximately). The type number is printed on the component side of each board, adjacent to the extractor tab, and it is also etched on the copper side.

Chrominance Type 131: This type is described in the 1968–69 volume. The following differences from the circuit diagram may be found on some boards:

1. C11 may be 5000pF.
2. C64 may be 220pF.
3. C72 may be 500pF, or 250pF.
4. C79 may not be fitted.
5. R23 may be 120k.
6. R94 may be 39k.

Interconnection Details (Chrominance Type 231):

EC7

1. To chassis
2. A.C.C. to I.F. board EC9/9
3. Bias to Video EC8/13
4. Earth return for colour control
5. 30V from power supply EC10/14
6. To colour control, live end
7. Not used
8. 30V pulse in from line timebase EC5/11
9. To chassis

PLG9—pins on board

1. R–Y to Video
2. Screens joined for R–Y and B–Y to Video
3. A.C. return for colour difference outputs
4. B–Y to Video

PLG10—pins on board

1. Inner
2. Screen

} Chrominance in on SKT10 through main cableform and SKT3 on I.F. board

Chrominance Type 231: This type is described in this volume.

Note: L11 should be designated "Set B–Y Phase". L9 and R103 form a matrix balance adjustment. R80 has been replaced by a shorting link.

Convergence: Two types of convergence module will be found in service, type 132 and type 232, employing different field convergence circuits. The two types are otherwise similar, and are completely interchangeable. The type number is printed on the component side of each board adjacent to the edge connector EC2A, and it is also etched on the copper side.

Convergence Type 132: This type is described in the 1968–69 volume. The following differences from the circuit diagram may be found on some boards:

1. C6 may be 0·47 μF.
2. C7 may be 1 μF.
3. C11 may be 0·22 μF.
4. R9 may be 10 ohms.
5. R11 may be 20 ohms.

6. R16 may be 20 ohms.
7. R18 may be 2 ohms.
8. R20 may be 10 ohms.
9. R21 may be 4·7 ohms or 2 ohms.
10. R26 may be 5 ohms.
11. R41 may not be fitted.
12. W1, W2 or W3 may be type AC128 with heat sink. A heat sink is not required with type AC153.

Interconnection Details (Convergence Type 232):

EC2A—on flying leads
1. Line timebase EC5/7
2. 220V line pulse in from line timebase EC5/21
3. Power supply EC10/11 (240V A.C. circuit)
4. Junction block EC3/12 (240V A.C. circuit)
5. Junction block EC3/8 (240V A.C. circuit)
6. Not used

EC2B—on flying leads

1. to 9. Waveforms out to convergence yoke

EC2C—on flying leads
1. Frame timebase and sound EC6/6 (frame earth)
2. Frame timebase and sound EC6/2 (frame scan)
3. C.R.T. pin 5 } C.R.T. A1 voltages
4. C.R.T. pin 4 } C.R.T. A1 voltages
5. C.R.T. pin 13 } C.R.T. A1 voltages
6. Chassis earth
7. Not used
8. Video EC8/9
9. Brightness control slider
10. I.F. board EC9/18 (A.G.C. circuit)
11. Power regulator EC11/12
12. Frame timebase and sound EC6/1
13. Chassis earth
14. Junction block EC3/7

PLG14—pins on board
1. Frame deflector coils earthy ends
2. Frame deflector coils earthy ends
3. Not used
4. Frame scan out to frame deflector coils

PLG15—pins on board
1. Line scan out to line deflector coils
2. Line deflector coils earthy ends
3. Line deflector coils earthy ends

PLG16—pins on board
1. Line scan in from line timebase
2. Line D.C. shift return for shift circuit on line timebase board
3. Line earth—line timebase board

PLG17—pins on board (socket is reversible)
1. Line earth out to blue lateral yoke coils
2. Not used
3. Correction waveform out to blue lateral yoke coils

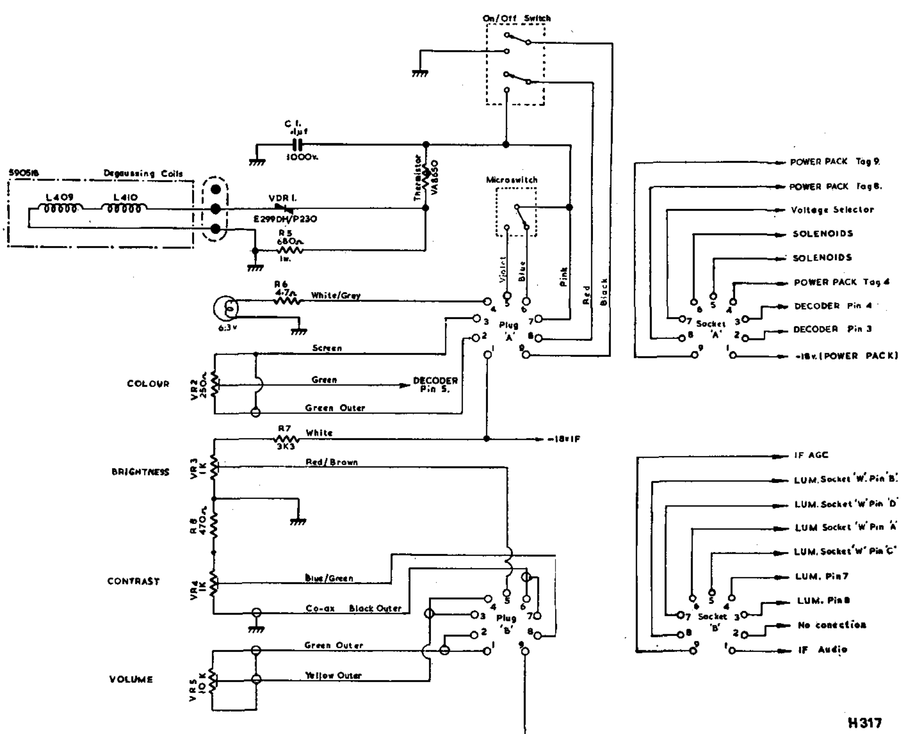
DECCA Model CTV25

General Description: The CTV25 receiver is designed for reception of colour and monochrome pictures on 625-lines, and monochrome pictures on 405-lines. The information that follows is provisional only but covers normal routine servicing, etc.

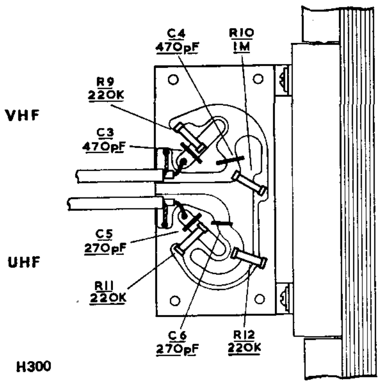
Control Panel Assembly: Thermistor (VA8650) and VDR1 (E299DH/P230).

Transistor	*Type*	*Function*
TR1	BF180	R.F. amplifier
TR2	AF139	Mixer oscillator bands 4 and 5; Mixer only bands 1 and 3
TR3	AF106	Oscillator bands 1 and 3

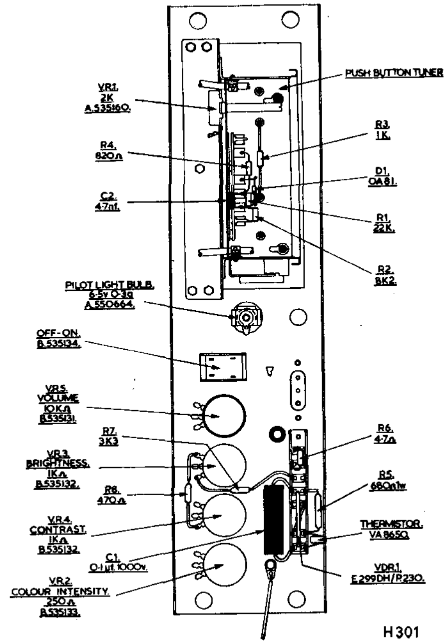
Diode	*Type*	*Function*
D1	OA81	(formerly OA47) A.G.C. Limiter (fitted externally to tuner)



(H317) Control Panel Circuit



H300



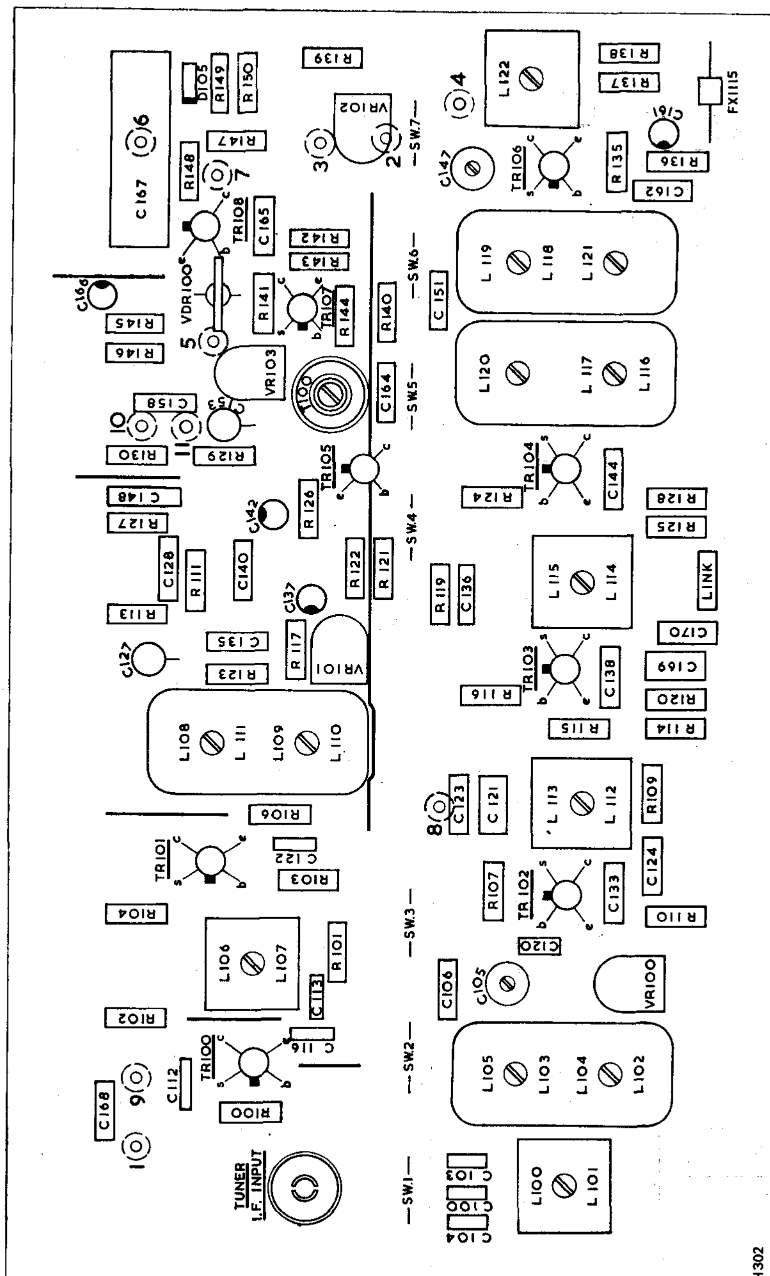
H301

(H300) Aerial Panel Lay-out (*Above*); (H301) Control Panel and Tuner Lay-out (*Right*)

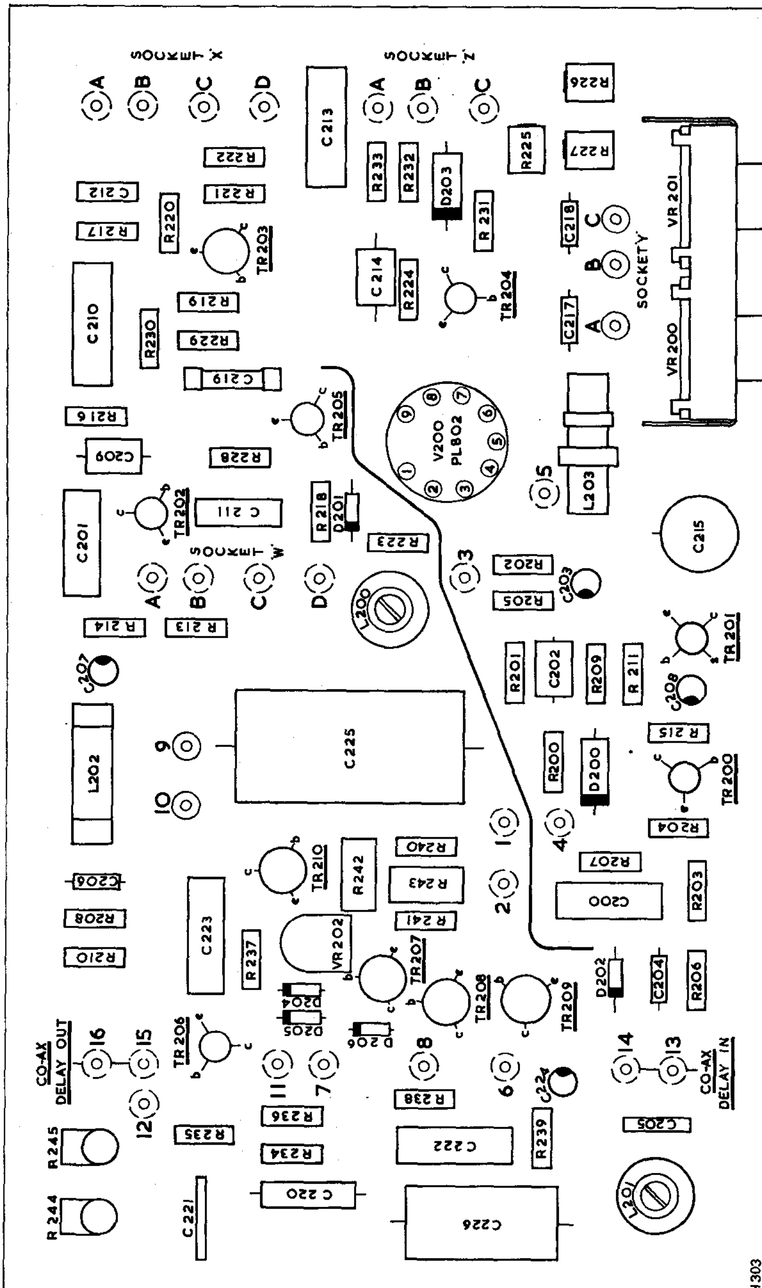
I.F. Board: For transistors and diodes see table below. Note that D105 was OA81.

Transistor	*Type*	*Function*
TR100	BF167	1st audio I.F.
TR101	BF173	2nd audio I.F.
TR102	BF167	1st vision I.F.
TR103	BF167	2nd vision I.F.
TR104	BF173	Final vision I.F.
TR105	BC108	Emitter follower
TR106	BF184	Video phase splitter
TR107	BF184	A.G.C. peak amplifier
TR108	BC108	A.G.C. amplifier

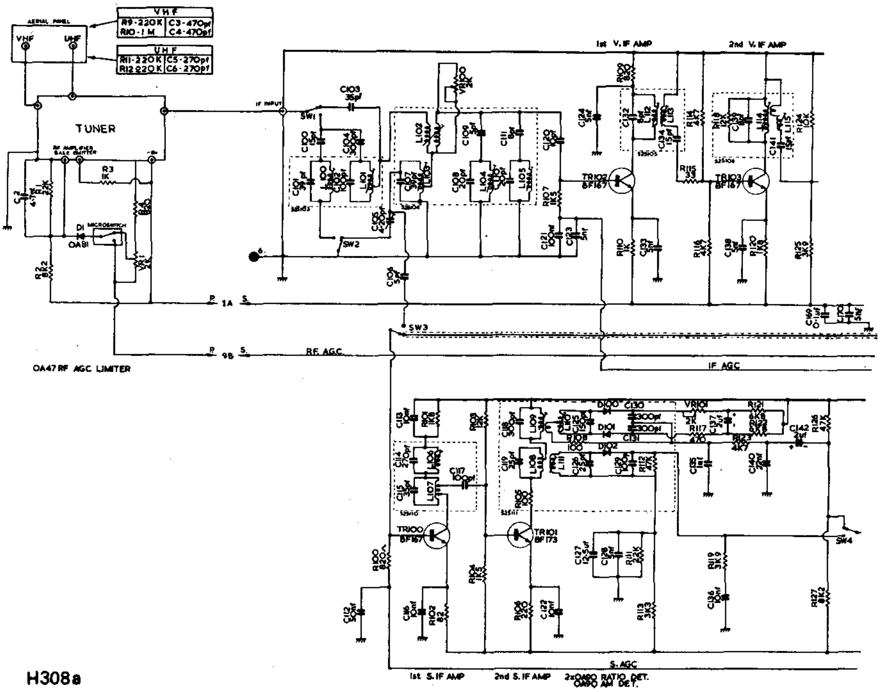
Diode	*Type*	*Function*
D103	OA90	Sound intercarrier detector
D105	OA47	I.F. A.G.C. limiter
D104	OA90	Video detector
D100 }	OA90	F.M. sound detector
D101 }	OA90	F.M. sound detector
D102	OA90	A.M. sound detector



(H302) I.F. Panel Lay-out



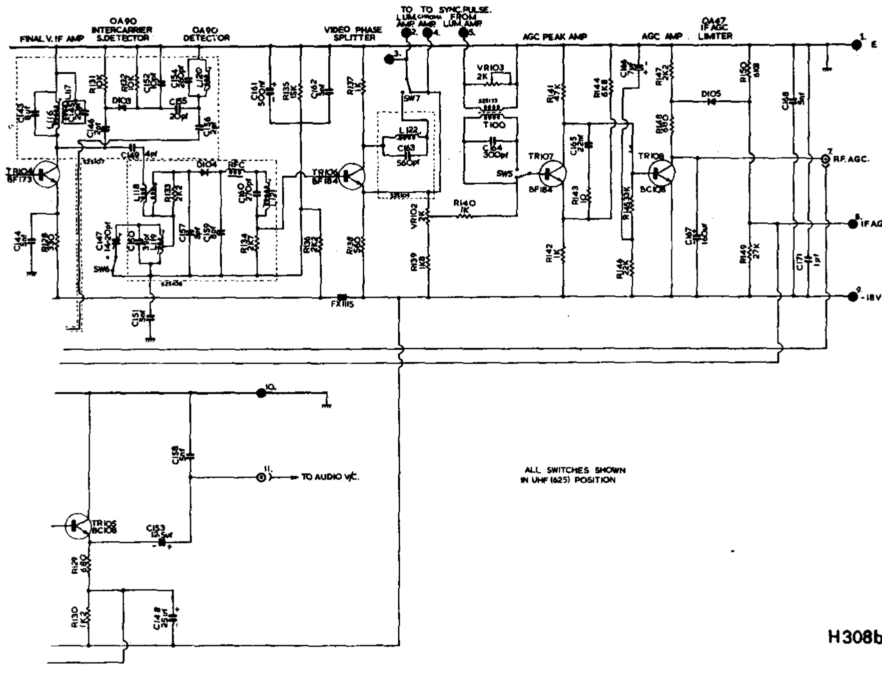
(H303) Luminance Panel Lay-out



(H308a) I.F. Panel Circuit—Model Decca CTV25 (Part)

Luminance Board: See tables below and on next page. D200–206 were D201–D207. TR207 was BC136 and TR208 was BC137.

Transistor	*Type*	*Function*
TR200	BF158	1st video amplifier
TR202	BC113	Emitter follower
TR201	BF115	A.G.C. and burst gate generator
TR203	BC117	Sync. separator
TR204	BC108	Line and frame blanking
TR205	AC128	Auto picture quality control
TR206	BC135	1st audio amplifier
TR207	BC137	P.N.P. driver
TR208	BC136	N.P.N. driver
TR209	BC138	Audio output
TR210	BC138	Audio output

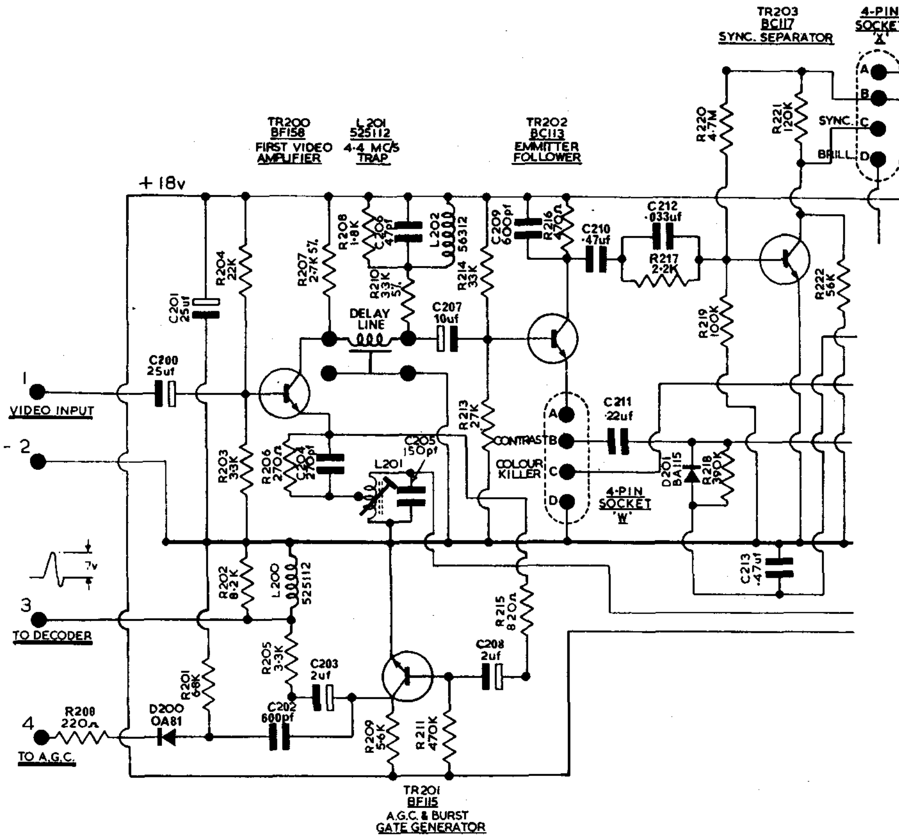


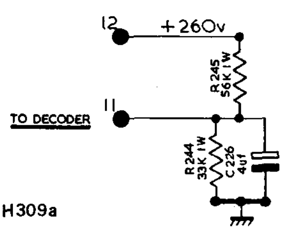
(H308b) I.F. Panel Circuit—Model Decca CTV25 (Continued)

See previous page for diode modifications.

Diode	*Type*	*Function*
D200	OA81	A.G.C. Feed
D201	BA115	D.C. restorer
D202	OA90	4·4 Mc/s. trap killer diode
D203	OA81	Line and frame blanking clamp
D204	BA130	Class B quiescent bias
D205	BA130	Class B quiescent bias
D206	BA130	Class B quiescent bias

Valve	*Type*	*Function*
V200	PL802	Final video amplifier

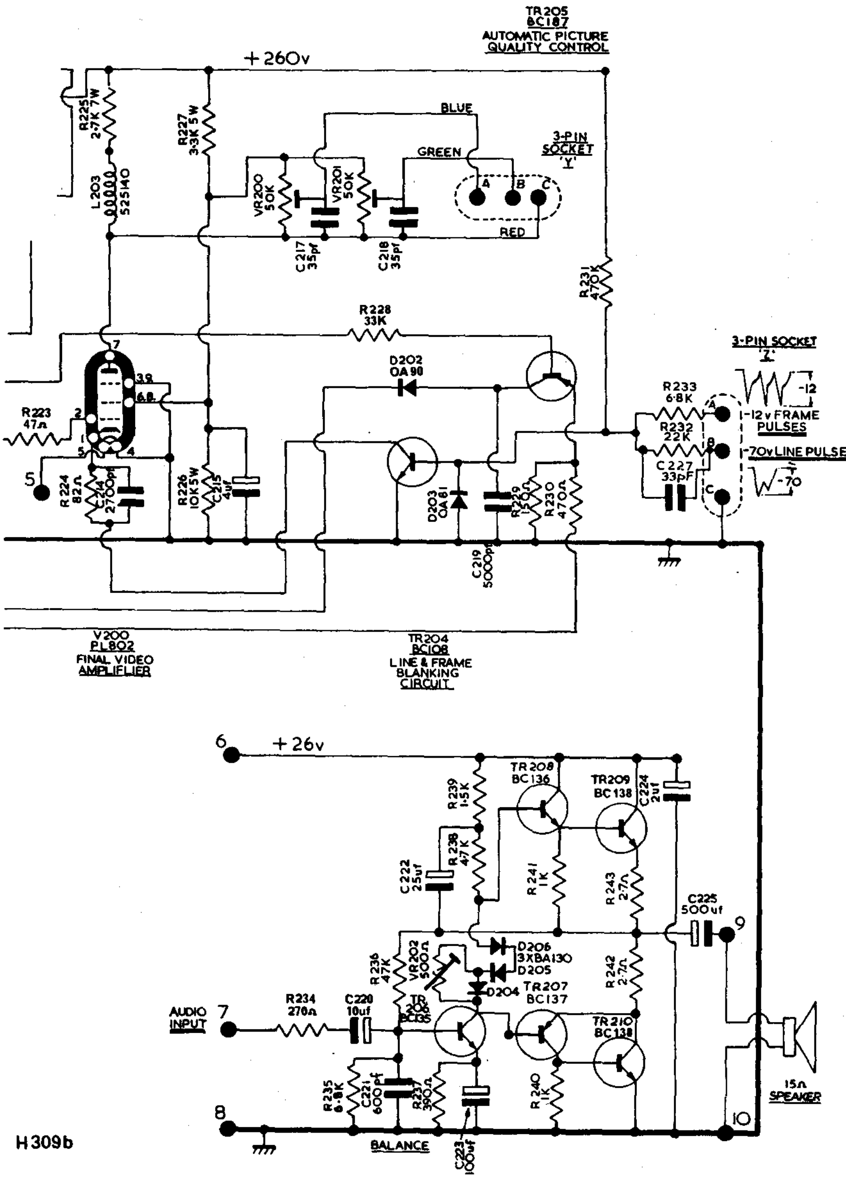




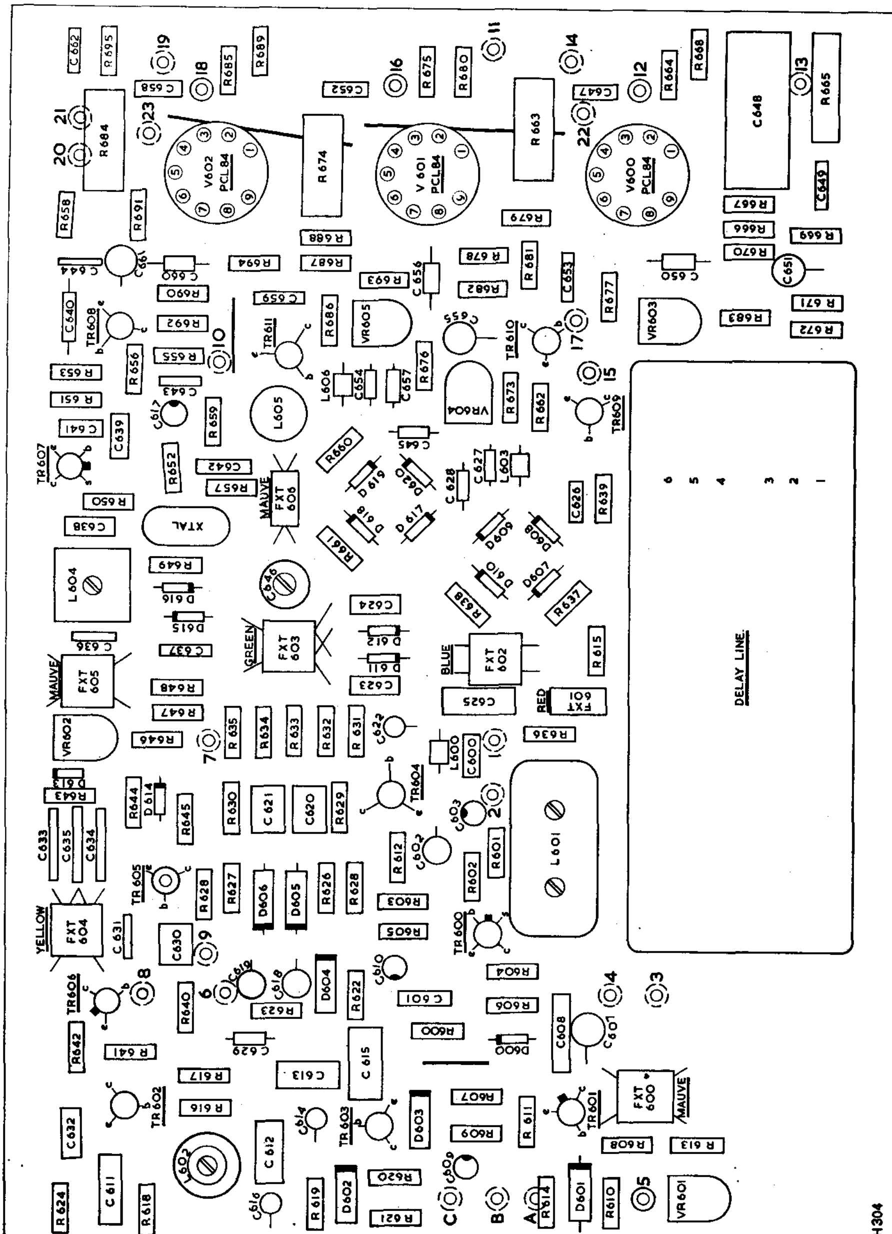
H309a

NOTE:-ALL RESISTORS 10% ¼ W. UNLESS SHOWN OTHERWISE
-C227 M^td ON COPPER SIDE OF BOARD, UNDER R232

(H309a) Luminance Panel Circuit—Model Decca CTV25 (Part)



(H309b) Luminance Panel Circuit—Model Decca CTV25 (Continued)



(H304) Decoder Panel Lay-out

Decoder Panel: Details are tabulated below

Transistor	*Type*	*Function*
TR600	BF184	1st chrominance amplifier
TR601	BC108	2nd chrominance amplifier
TR602	BC113	7·5 Kc/s. amplifier
TR603	BC113	7·5 Kc/s. emitter follower
TR604	BC113	Bi-stable switch
TR605	BC113	
TR606	BC108	Gated burst amplifier
TR607	BF184	Crystal controlled oscillator
TR608	BC108	Emitter follower
TR609	BC113	R–Y pre-amplifier
TR610	BC113	G–Y pre-amplifier
TR611	BC113	B–Y pre-amplifier

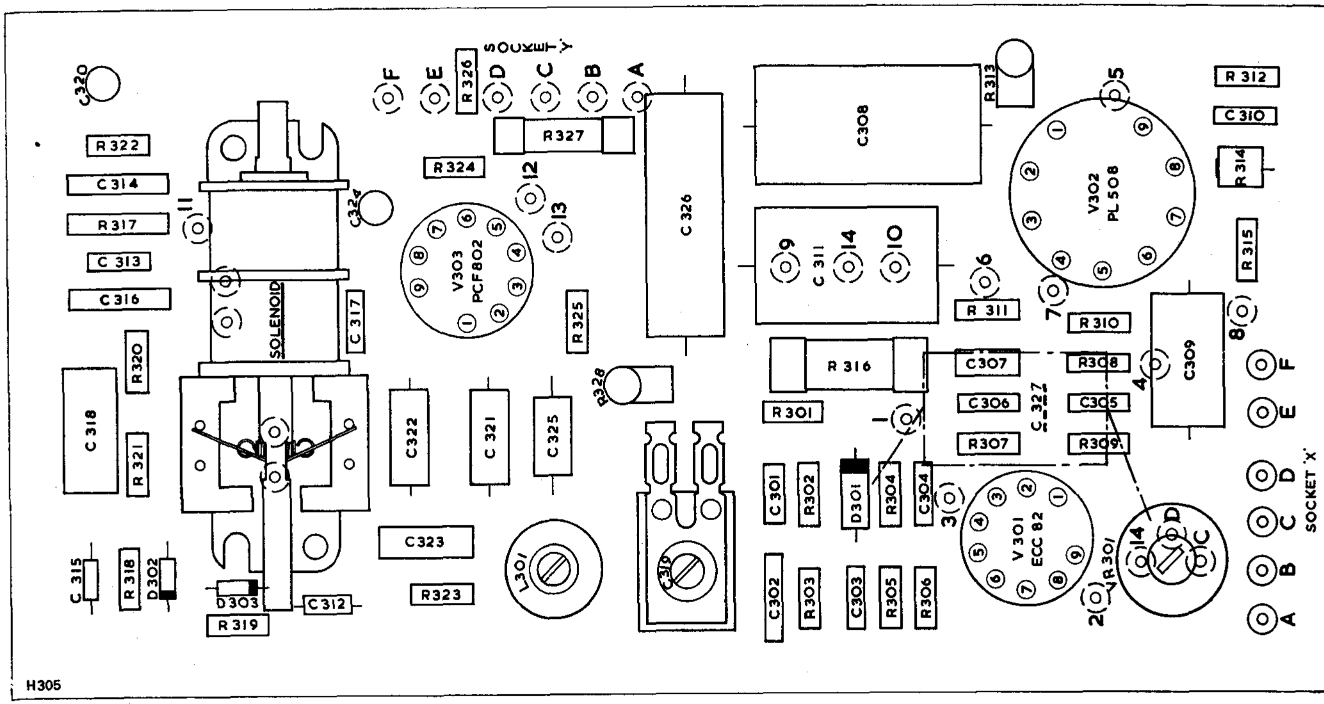
Diode	*Type*	*Function*
D600	OA90	Killer limiting
D601	OA81	Line blanking feed clamp
D602	OA81	7·8 Kc/s. negative clamp
D603	OA81	Killer voltage rectifier
D604	OA81	Ident. feed diode
D605	OA81	Bi-stable feed diode
D606	OA81	Bi-stable feed diode
D607	OA90	R–Y bridge demodulator
D608	OA90	
D609	OA90	
D610	OA90	
D611	OA90	Phase reversal diodes
D612	OA90	
D613	BA115	Phase discriminator
D614	BA115	
D615	BA102	Capacity diodes (crystal control)
D616	BA103	
D617	OA90	B–Y ring demodulator
D618	OA90	
D619	OA90	
D620	OA90	

Valve	*Type*	*Function*
V600	PCL84	Final R–Y amplifier
V601	PCL84	Final G–Y amplifier
V602	PCL84	Final B–Y amplifier

E.H.T. Unit: see following table

Valve	*Type*	*Function*
V400	PY500	Boost diode
V401	PL509	Line output
V402	PD500	E.H.T. stabiliser
V403	GY501	E.H.T. rectifier

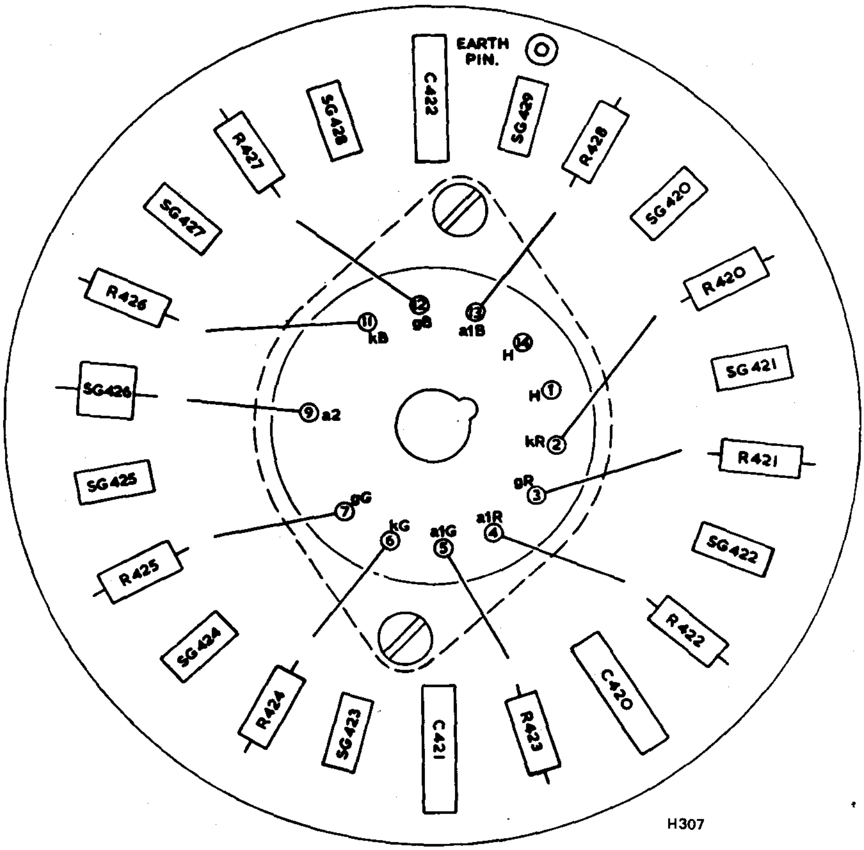
Note: D401 is a solid state device diode (TV 6·5) which acts as a focus voltage rectifier.



(H305) TIMEBASE PANEL LAY-OUT AND VALVE AND DIODE FUNCTIONS—MODEL CTV25

Valve	*Type*	*Function*
V301	ECC82	Frame oscillator
V302	PL508	Frame output
V303	PCF802	Line oscillator

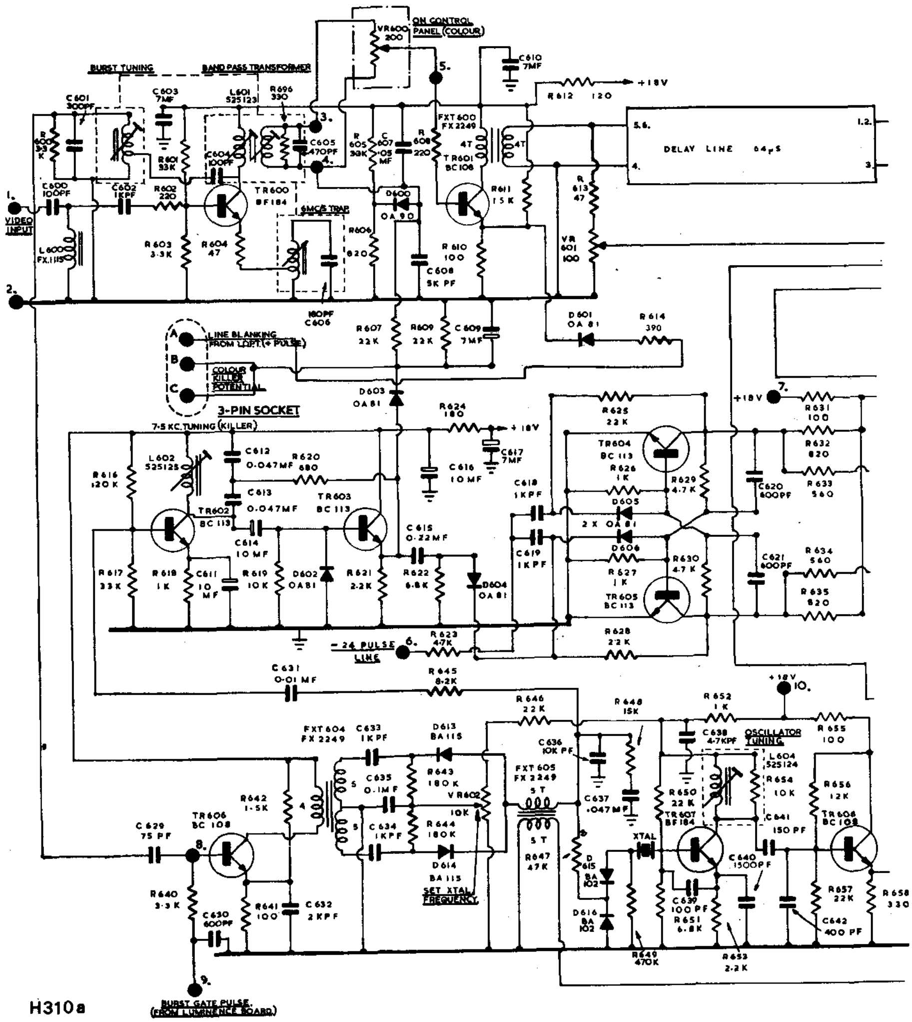
Diode	*Type*	*Function*
D301	OA81	Sync. input (field oscillator)
D302	BA115	Line flywheel
D303	BA115	



(H307) SPARK GAP PANEL LAY-OUT

Power Unit (Phase 1): see following table.

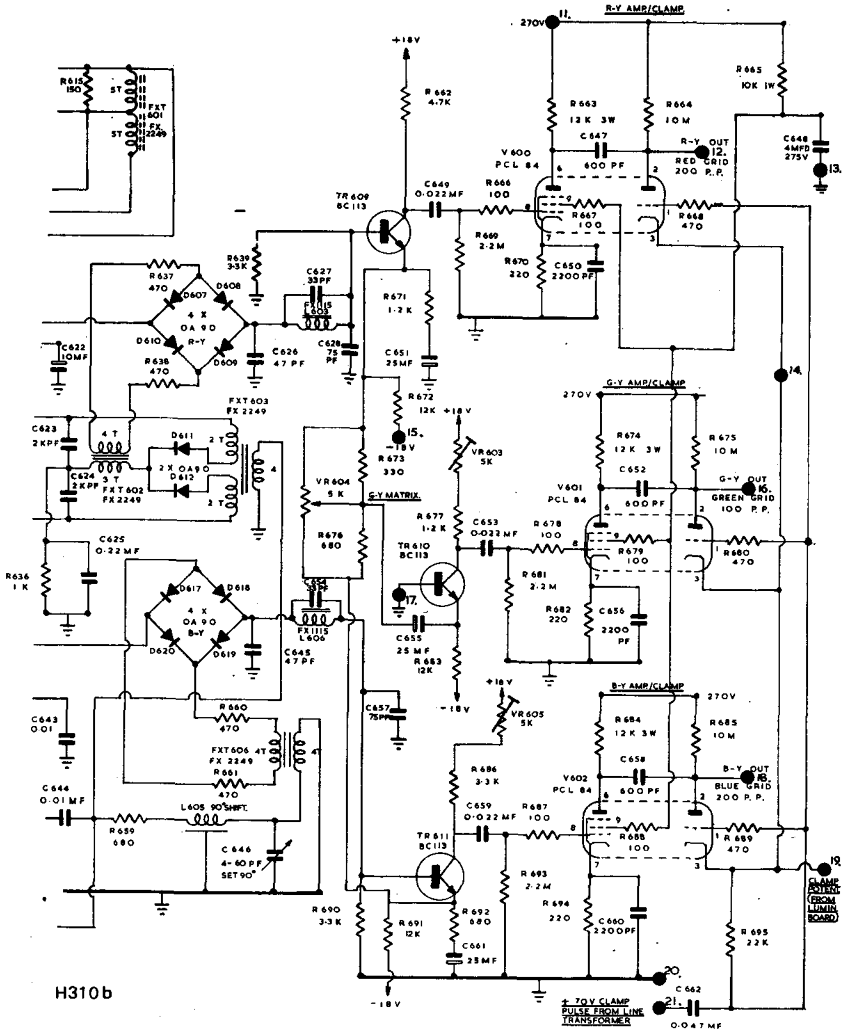
Diode	*Type and function*
D700	Type SFR.251 + 18-volt rectifier
D701	Type SFR.251 − 18-volt rectifier
D702	I.N. 5054 mains rectifier



(H310a) Decoder Panel Circuit—Model Decca CTV25 (Part)

Voltage Chart (Power Unit): A.C. Readings

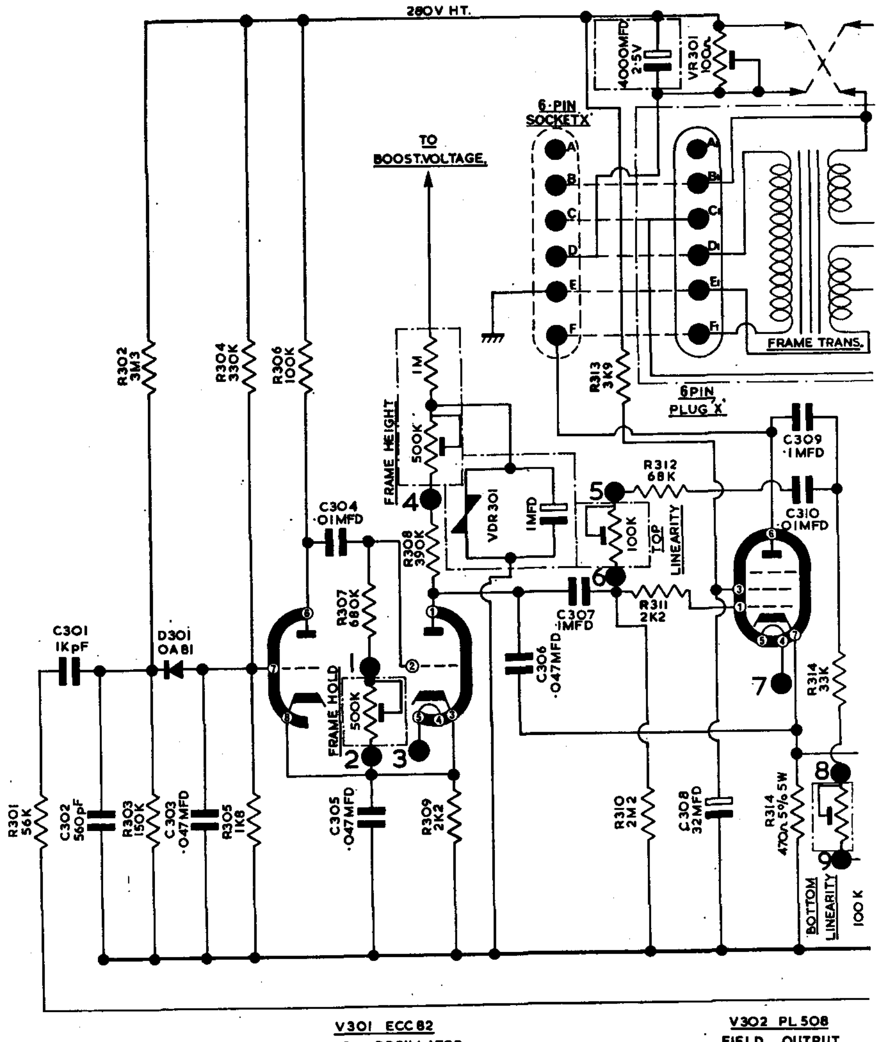
Red	240-volt A.C.—after 8 ohms res. 235 A.C.
Orange	215 volts
Green	193 volts
A.C. to low voltage diodes	20 volts



(H310b) Decoder Panel Circuit—Model Decca CTV25 (Continued)

Voltage Chart (Power Unit): D.C. Readings

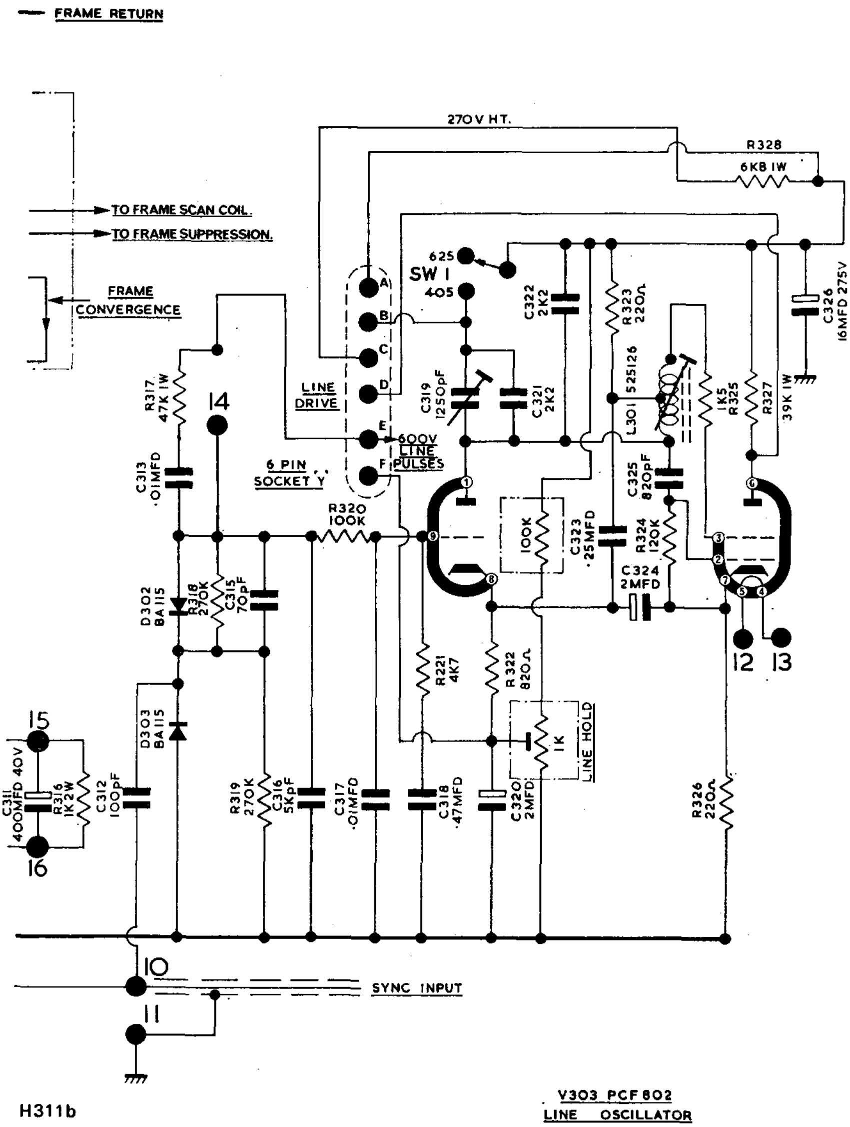
H.T. Rail	After D702–281 volts
Video and Chroma H.T.	After R703–260 volts
Frame H.T.	After R705–260 volts
Line H.T.	After R704–265 volts



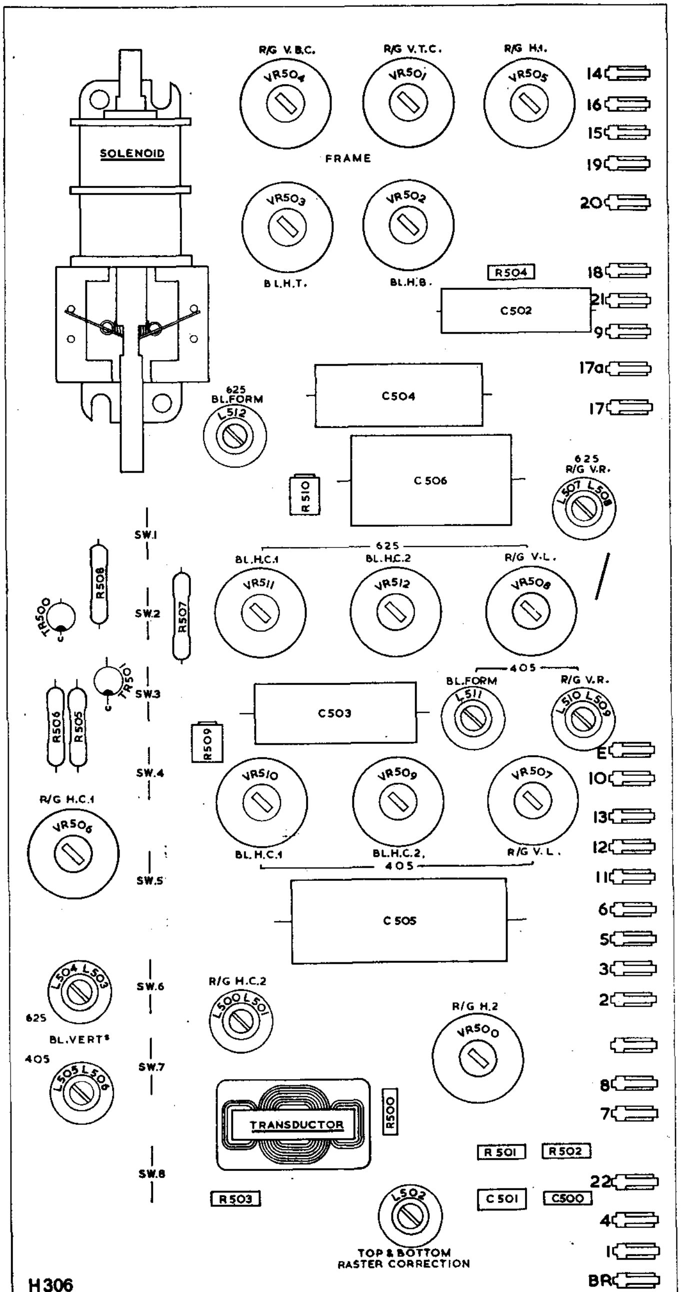
NOTE: ALL RESISTORS ARE 10% TOLERANCE & 1/4 WATT UNLESS STATED. COMPONENTS ENCLOSED WITH CHAIN DOTTED LINE ARE SEPARATE FROM PRINTED CIRCUIT BOARD.

H311a

(H311a) Timebase Panel Circuit—Model Decca CTV25 (Part)



(H311b) Timebase Panel Circuit—Model Decca CTV25 (Continued)



(H306) CONVERGENCE
PANEL LAY-OUT

Voltage Chart (I.F. Panel): Transistors

Transistor	*Emitter, volts*	*Base, volts*	*Collector, volts*
TR100	−19	−18	−8
TR101	−18·5	−17·5	−0·6
TR102	−13·5	−12·5	−4·1
TR103	−10·5	−9·75	zero
TR104	−15	−14·5	zero
TR105	−14	−12·5	zero
TR106	−16·7	−15·7	−4·9
TR107	−16·5	−16·75	−12·5
TR108	−19·5	−19	−17·25

Voltage Chart (Decoder Panel): Transistors

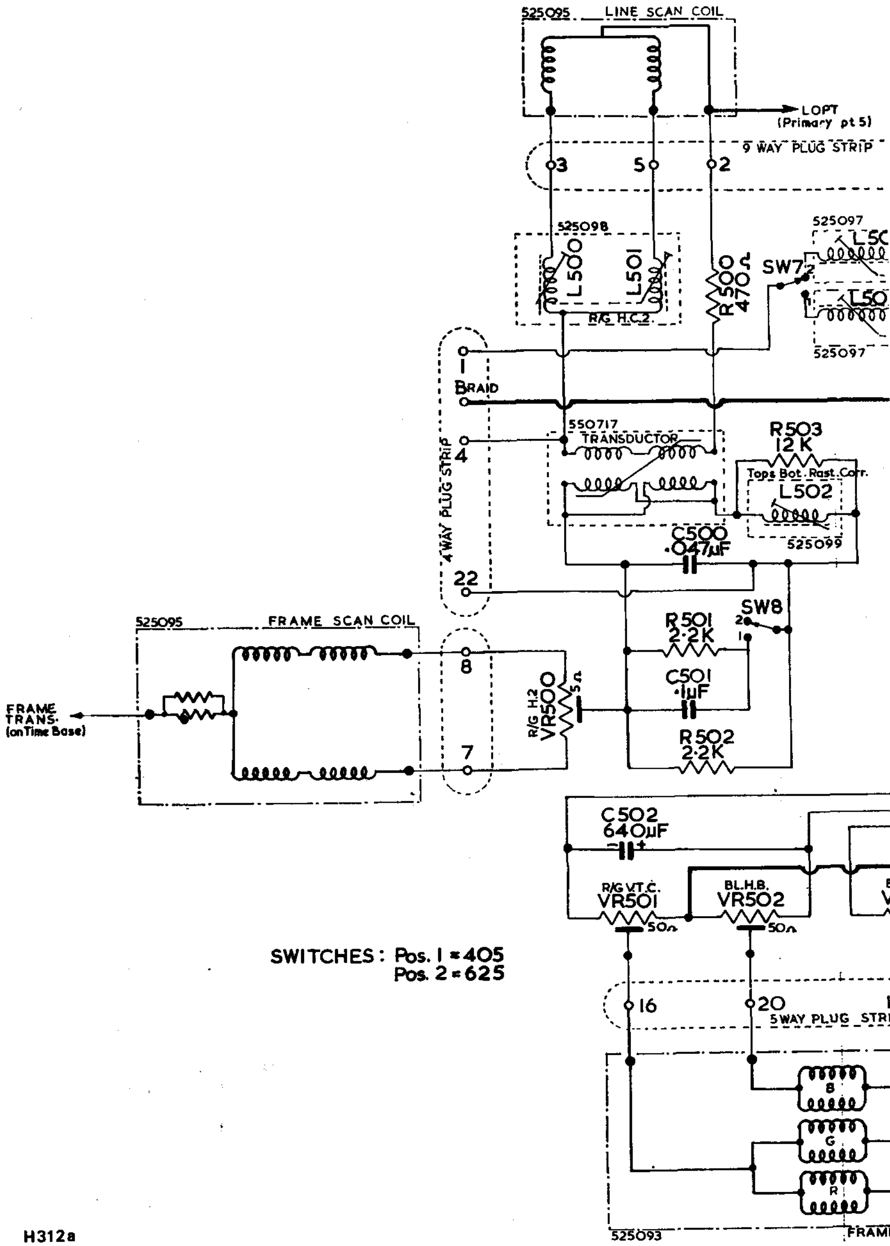
Transistor	*Base, volts*	*Emitter, volts*	*Collector, volts*	*Screen, volts*
TR600	1·0	0·5	13·5	—
TR601	3·10	2·8	13·5	—
TR602	2·75	2·5	15	—
TR603	6·2	7·5	15	—
TR604	0·4	zero	5·5	—
TR605	0·4	zero	5·3	—
TR606	zero	1	15	—
TR607	3·5	3·5	16	—
TR608	9·0	8·75	16	16
TR609	zero	zero	11·5	—
TR610	zero	zero	15	—
TR611	zero	zero	9·0	—

Voltage Chart (Decoder Panel): Valves

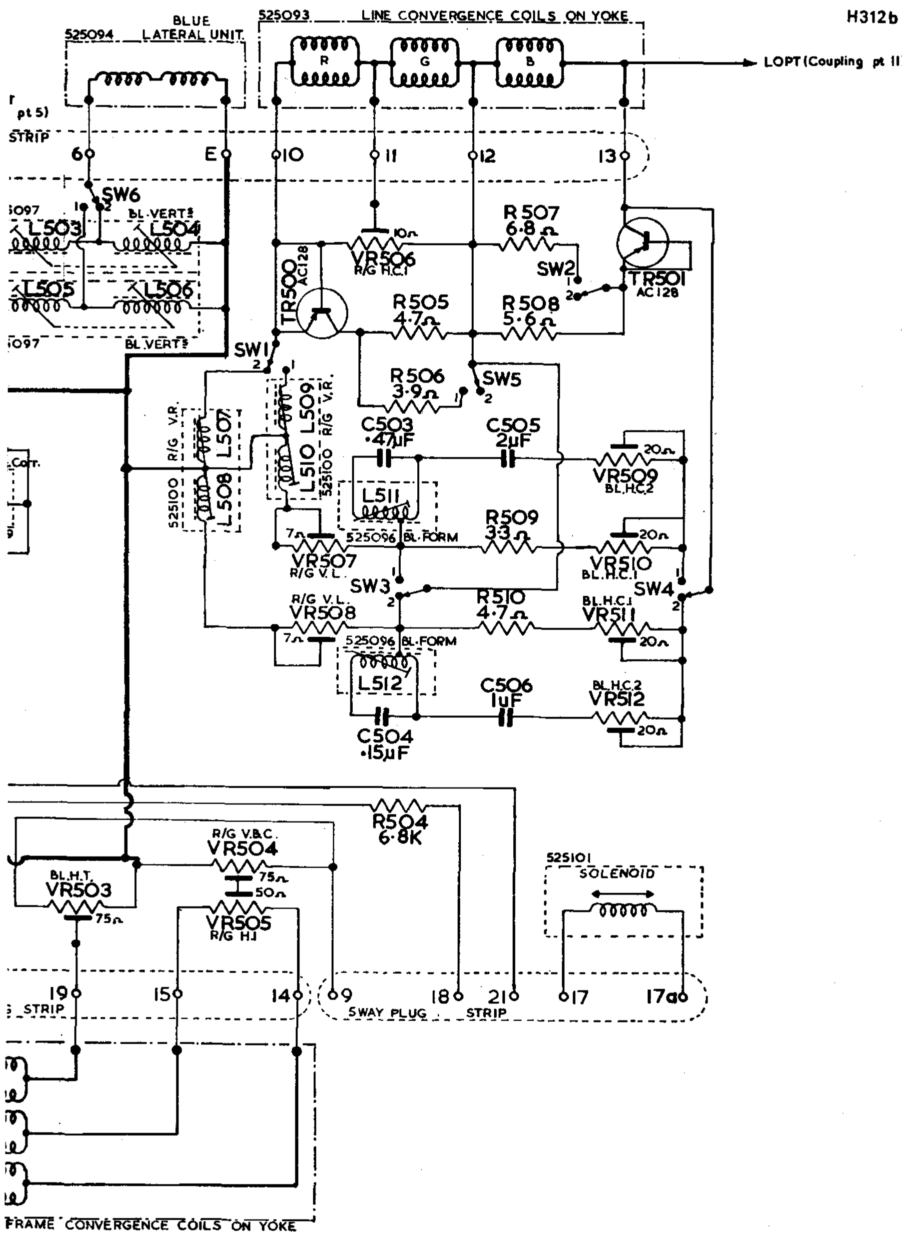
Valve		*Volts*
V600 (PCL84) V601 (PCL84) V602 (PCL84)	Anode (T)	90
	G1 (T)	19
	G2 (P)	178
	G1 (P)	zero
	Anode (P)	110
	Cathode (P)	2·8
	Cathode (T)	100

Voltage Chart (Luminance Panel): Transistors

Transistor	*Base, volts*	*Emitter, volts*	*Collector, volts*
TR200	2·15	1·5	10·5
TR201	−0·3	zero	15·5
TR202	8·7	7·5	17
TR203	—	zero	61
TR205	2·4	2·6	0·5
TR204	0·4	zero	0·25
TR206	1·4	0·75	12·5
TR207	11·75	12·5	0·65
TR208	13·75	13·5	25
TR209	13·25	12·5	25
TR210	0·5	zero	13



(H312a) Convergence Panel Circuit—Model Decca CTV25 (Part)



(H312b) Convergence Panel Circuit—Model Decca CTV25 (Continued)

Voltage Chart (Luminance Panel): Valve

Valve		*Volts*
V200 (PL802)	Anode	245
	G1	0·5
	G2	200
	Cathode	0·45

Voltage Chart (Timebase Panel): Valves

Valve		*Volts*
V301 (ECC82)	Anode (A)	81·5
	Grid (A)	1·3
	Anode (B)	5·5
	Grid (B)	−21·5
	Cathode	5·0
V302 (PL508)	G2	220
	Anode	262
	Cathode	21
V303 (PCF802)	Anode (T)	200
	G1 (T)	1·15
	G2 (P)	195
	G1 (P)	−51
	Anode (P)	120
	Cathode (P)	1·85
	Cathode (T)	2·0

Voltage Charts Note: All readings taken with Avometer 8, under signal conditions with controls at minimum position.

Convergence: The complete procedure for factory convergence is given below. Before setting up convergence check: (*a*) E.H.T. (*b*) Focus (both 405 and 625). (*c*) Stabiliser current with tube beam current cut off. (*d*) Line width and linearity. (*e*) Frame height and linearity.

Convergence (Overall):

(1) Set all controls on the convergence panel to their mid-positions.

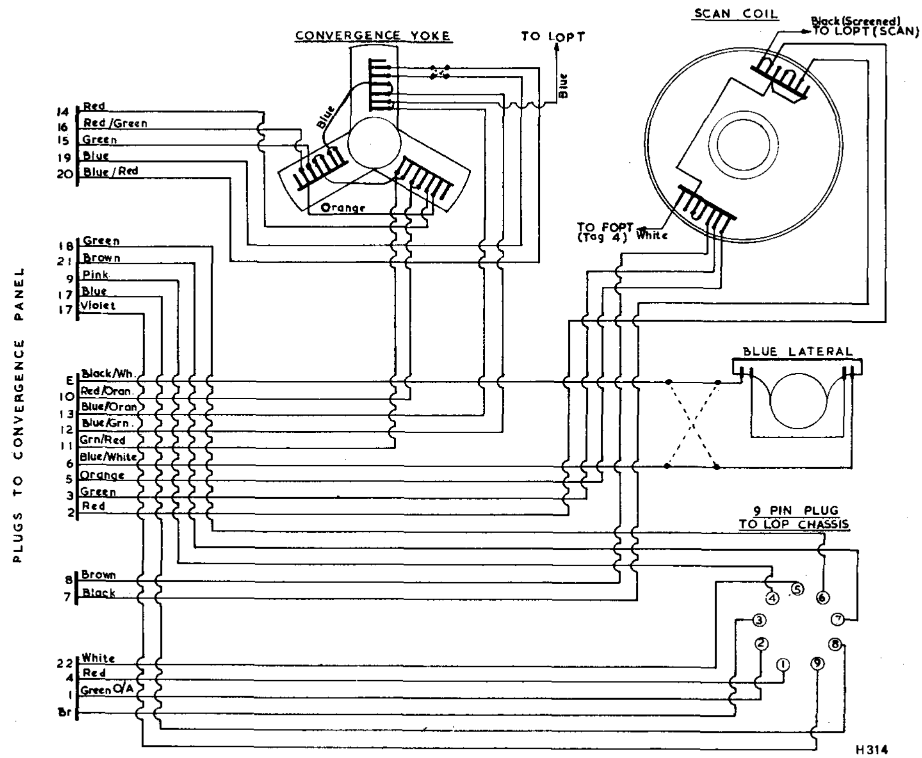
(2) Degauss the shadow mask and all metal parts which are near (avoid purity magnets and deflection yoke).

(3) Set the purity magnets to zero field (tags together). With a dot or crosshatch pattern applied to the receiver switch to 625 position and adjust red/green static magnets for centre convergence (blue gun off). Switch on the blue gun and adjust blue vertical and lateral magnets for centre convergence. Repeat the whole procedure if required.

(4) Turn on the plain red raster by turning down blue and green screen potentials. Push deflector coils back as far as possible. Adjust the purity rings for central red area and then gradually push the deflector coils forward, *until uniform red field is obtained.*

The best procedure is to start with the purity ring tags together then gradually spreading them apart and also rotating the whole unit.

(5) Repeat steps (3) and (4) if necessary.



(H314) Scanning and Convergence Wiring

Convergence (Field):

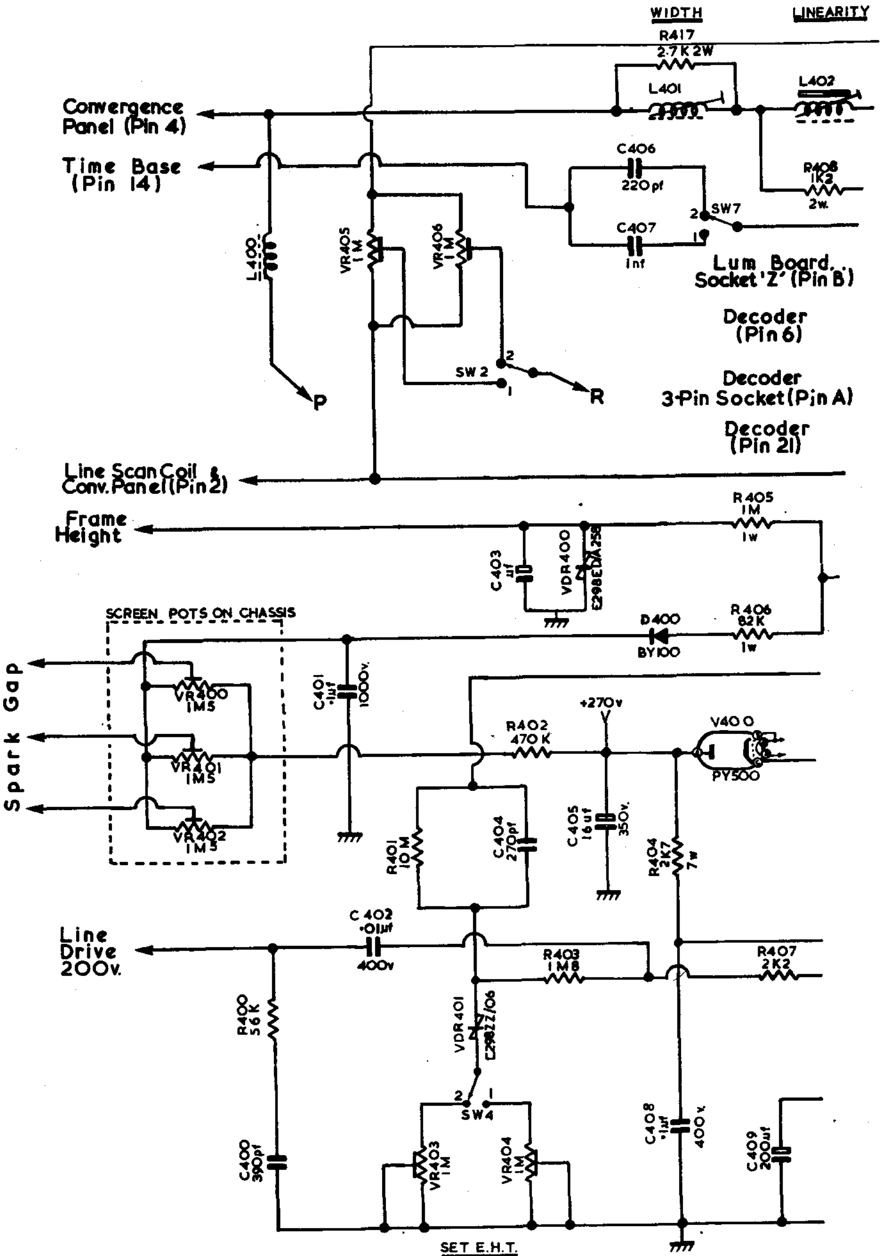
(6) Turn on the red and green guns with a crosshatch pattern applied. Adjust red/green vertical top centre and red/green vertical bottom centre controls for parallel or coincident central vertical line of red and green guns. Concentrate mainly on central portion.

(7) Adjust red/green horizontal 1 and red/green horizontal 2 controls until red and green horizontal lines are parallel or coincident. Adjust static red and green magnets if necessary for best red/green convergence in the centre of the tube.

(8) Turn on the blue gun. Adjust the blue horizontal top and blue horizontal bottom controls for equal displacement of blue horizontal lines. Adjust blue vertical control for equal displacement of blue vertical lines. With blue vertical and lateral magnets bring blue in to coincidence with red/green.

Convergence (625-lines):

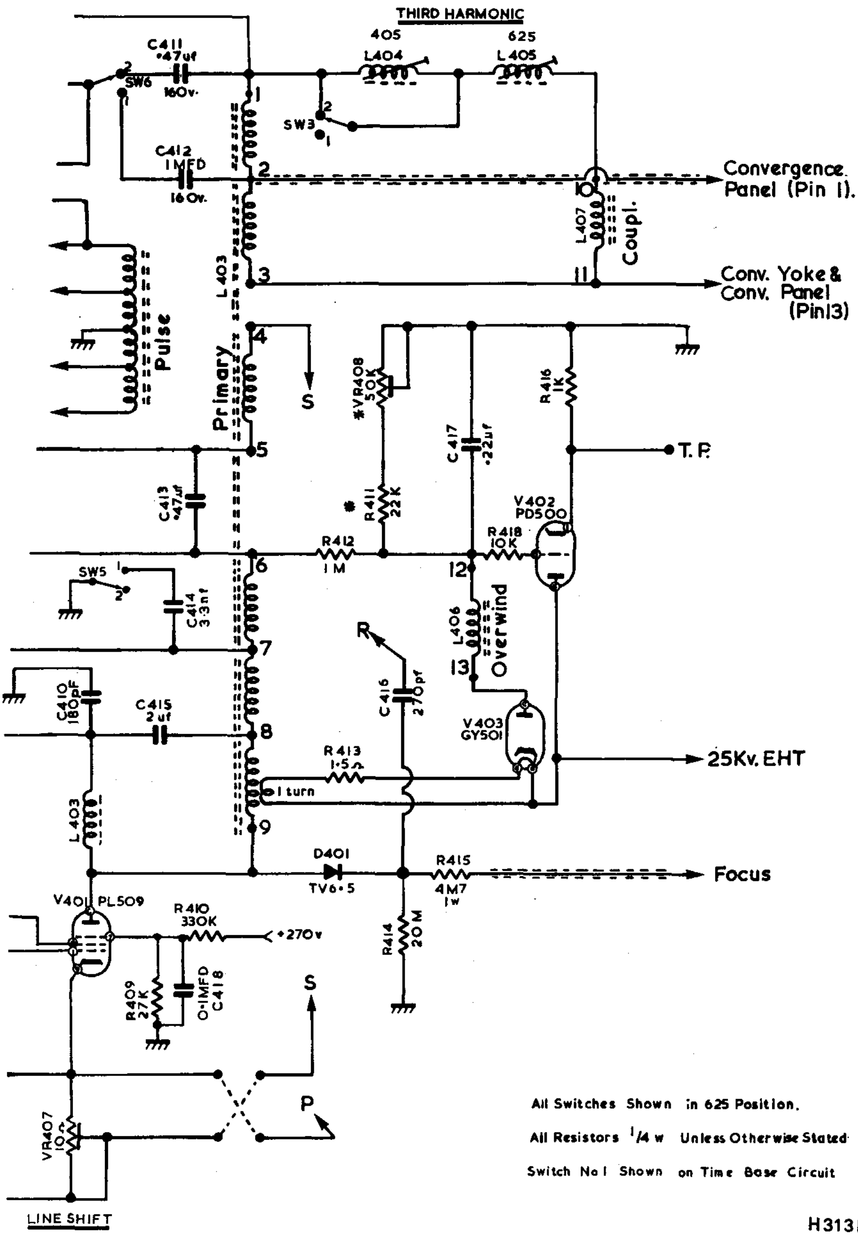
(9) (*a*) Turn off the blue gun and adjust red/green vertical right and red/



* NOTE:-IN CERTAIN CHASSIS VR408=25K & R411=47K

H313a

(H313a) L.O.P. Chassis Circuit—Model Decca CTV25 (Part)



(H313b) L.O.P. Chassis Circuit—Model Decca CTV25 (Continued)

green vertical left controls for best convergence of vertical lines. (*b*) Adjust red/green horizontal centre 1 and red/green horizontal centre 2 for best central horizontal line. (*c*) Turn on the blue gun and adjust blue horizontal centre 1, blue horizontal centre 2 and blue form for best central horizontal line. Adjust static convergence if necessary.

The above procedure completes the convergence set-up on 625 lines. If the set still exhibits lack of purity, the purity adjustment must be repeated —steps (3) and (4). In adjusting the dynamic convergence, it is preferable to move controls only a small amount at a time, since most of the controls are interdependent, i.e. when setting red/green vertical left control it would also vary verticals on the right.

Convergence (405-lines):

(10) (*a*) Switch to 495 lines. Turn off blue gun. Adjust blue vertical left control for best convergence of red and green gun. (*b*) Turn on the blue gun. Adjust blue horizontal centre 1, blue horizontal centre 2 and blue form for central horizontal line.

Do not adjust static magnets when adjusting 405-line convergence.

At present there is only one red/green vertical right coil which is common to both 625 and 405 systems and it may be necessary to compromise between the two systems. At a later date this control will be duplicated to allow independent adjustment on both systems.

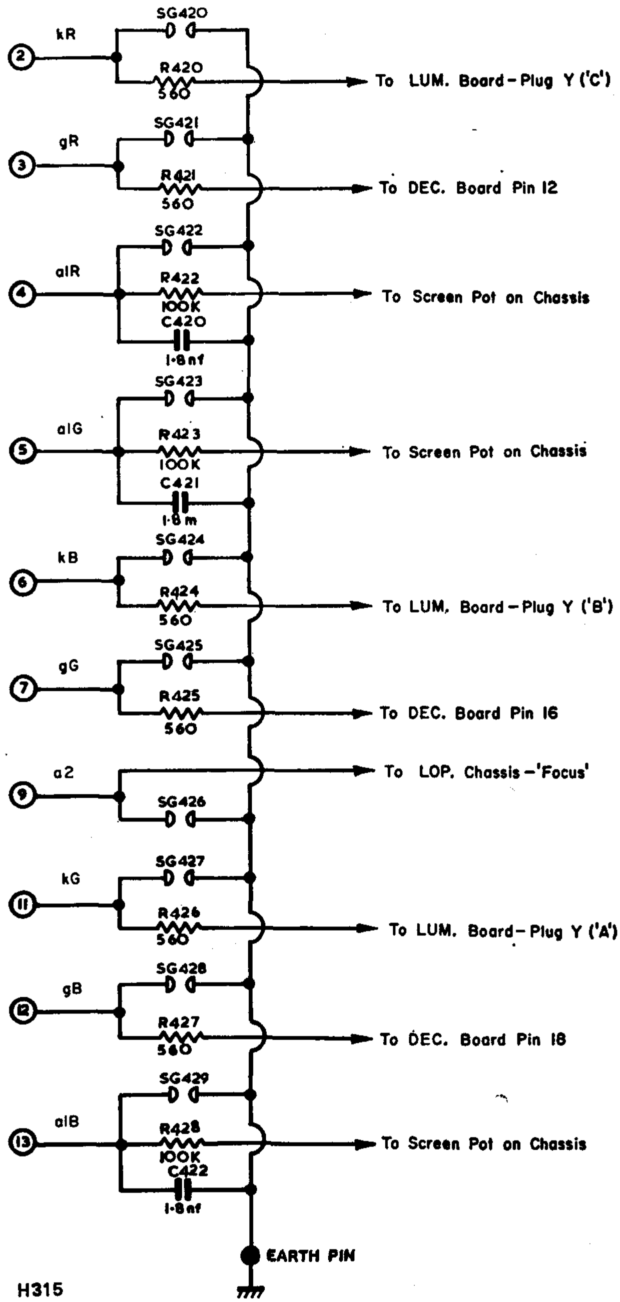
Power Unit (Phase 2): The phase 2 power unit applies to sets after Table Model Ser. No. 318544, and Console Model Ser. No. 312519. Its adoption has produced the revised voltage readings given below.

Revised Voltage Readings (Power Unit):

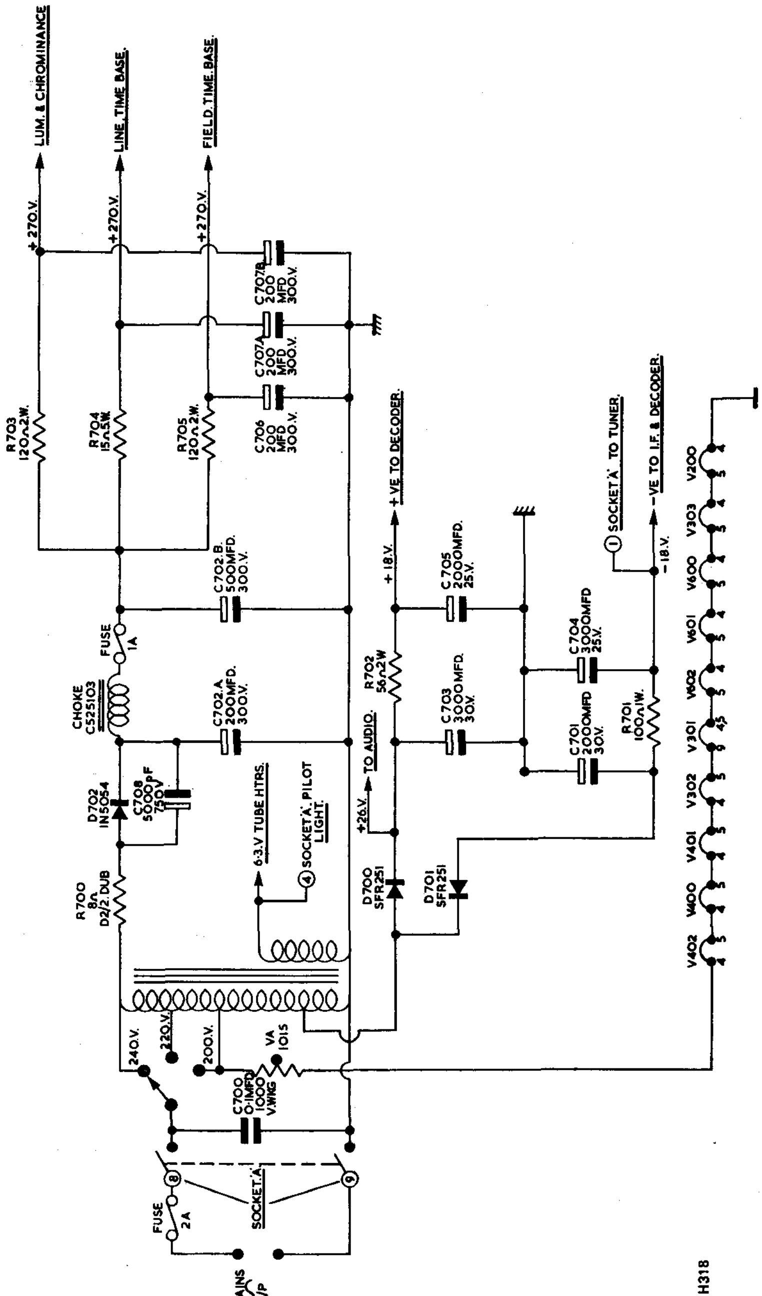
	Volts
Input voltage	240 A.C.
After rectifiers D.701, D.702	297 D.C.
After choke L.700	282
Supply to audio	26
Voltage across bridge rectifiers	37 A.C.
Smoothed outputs	+18
	−18
Voltage across heater chain after VA1015	186 A.C.

Revised Voltage Readings (Decoder Panel):

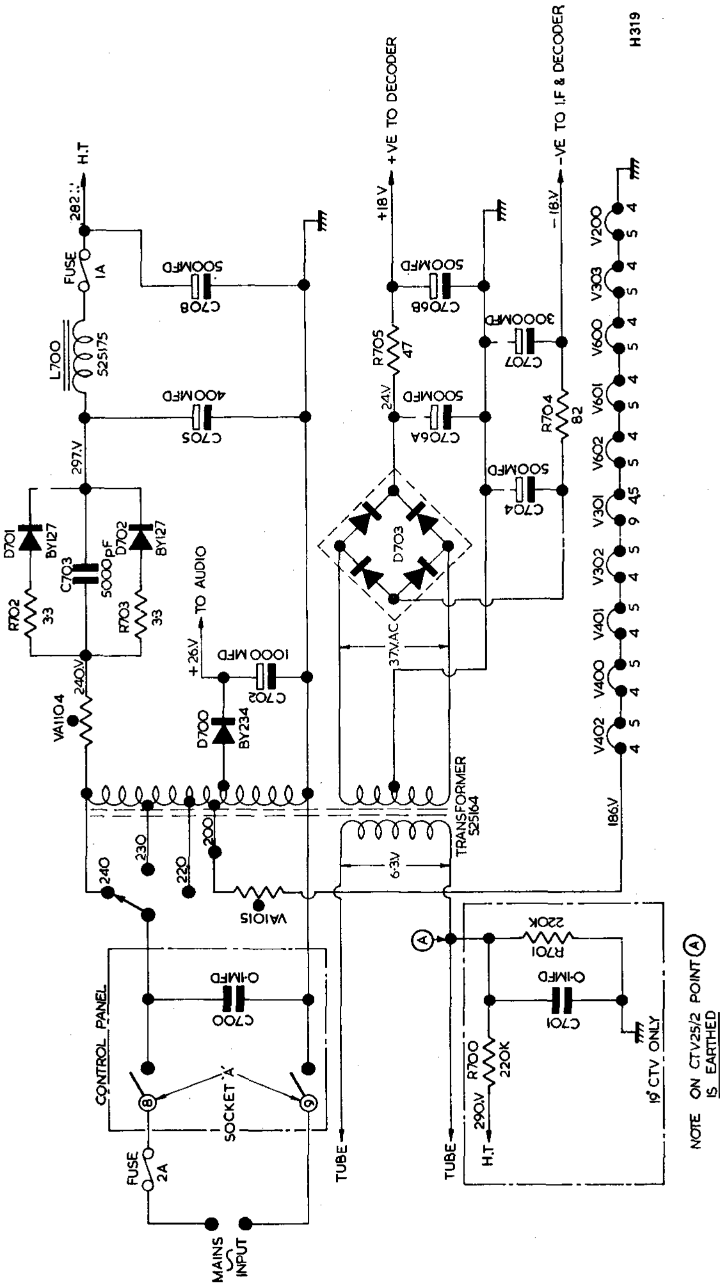
Valve		*Volts*
V600 (PCL84), V601 (PCL84), V602 (PCL84)	Anode (T)	100
	G1 (T)	55
	G2 (P)	190
	G1 (P)	zero
	Anode (P)	130
	Cathode (P)	3·2
	Cathode (T)	105



(H315) SPARK GAP PANEL CIRCUIT



(H318) Power Pack Circuit—Phase I



(H319) Power Pack Circuit—Phase 2

Revised Voltage Readings (Timebase Panel):

Valve		*Volts*
V301 (ECC82)	Anode (A)	95
	Grid (A)	1·5
	Anode (B)	56
	Grid (B)	−22
	Cathode	50
V302 (PL508)	G2	235
	Anode	262
	Cathode	21
V303 (PCF802)	Anode (T)	202
	G1 (T)	0·5
	G2 (P)	200
	G1 (P)	−52
	Anode (P)	133
	Cathode (P)	1·6
	Cathode (T)	4

Revised Voltage Readings (Luminance Panel):

Valve		*Volts*
V200 (PL802)	Anode	250
	G1	−1·4
	G2	225
	Cathode	1·0

Modifications: A history of modifications is given below so that service engineers can locate divergencies from model to model. Note that sets which use the phase 2 power pack are classed as CTV 25/2.

Modifications (Control Panel Circuit): D1 was OA47, is now OA81.

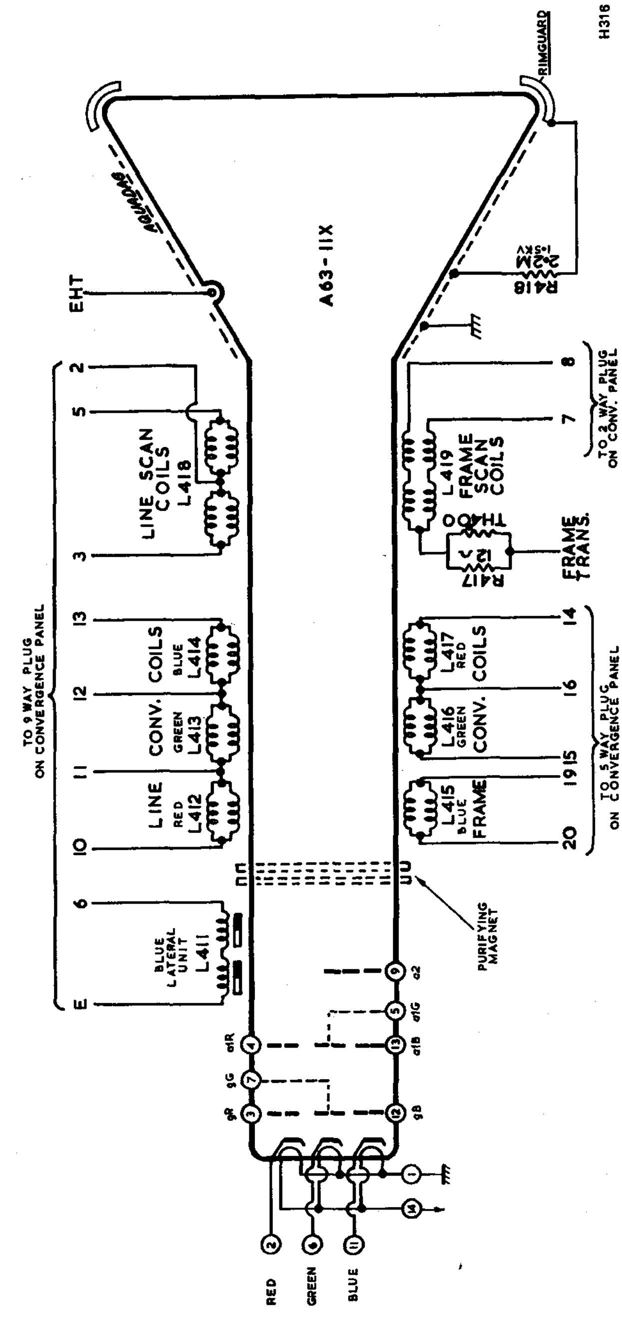
Modifications (Power Units): C708 (5000 pF.) added across C702.

Modifications (I.F. Panel Lay-out): 1. 2–148's shown, now one R150 in extreme top right-hand of drawing. 2. R135 was C135, now R135. 3. C148—position now slightly changed on lay-out.

Modifications (I.F. Panel Circuit): 1. R12 was 1 meg. now 220k. 2. R100 was 3·9k now 820 ohms. 3. R102 was 150 ohms now 82 ohms. 4. R113 was 8·2k now 3·3k. 5. R126 was 100k now 47k. 6. R127 was 47k now 8·2k. 7. R129 was 1·2k now 680 ohms. 8. R130 was 680 ohms now 1·2k. 9. R141 was 39k now 47k. 10. R148 was 820 ohms now 68 ohms. *Note:* 2–148's shown in error. One now R150 (6·8k). 11. C148 change in circuit. Now across R130. 12. C169 (200 pF.) now deleted. 13. D105 was OA81 now OA47. 14. C171 (1 μF.) added—18-volt line to ground.

Modifications (Luminance Panel Assembly): D201–207—all wrongly numbered. Now D200–206.

Modifications (Luminance Panel Circuit): 1. C200 was 10 μF. now 25 μF. 2. C204 was 100 pF. now 270 pF. 3. C205 was 200 pF. now



(H316) TUBE AND ASSOCIATED COMPONENTS

150 pF. 4. C214 was 1000 pF. now 2700 pF. 5. C215 was 8 μF. now 4 μF. 6. C227 (33 pF.) added across R332. 7. R215 was 150 ohms now 820 ohms. 8. R229 was 100 ohms now 150 ohms. 9. R230 was 560 ohms now 470 ohms. 10. R232, 233. These two resistors change positions on circuit. 11. R242 was 1 ohm now 2·7 ohms. 12. R243 was 1 ohm now 2·7 ohms. 13. 3-pin socket (Z) A and B now reversed. 14. TR207 was BC136 now BC137. 15. TR208 was BC137 now BC136.

Modifications (Decoder Circuit): 1. C640 was 400 pF. now 1500 pF. 2. R614 was 220 ohms now 390 ohms. 3. R683 was 2k now 12k. 4. R691 was 2k now 12k.

Modifications (Timebase Panel): C319 was 1000 pF. now 125 pF.

Modifications (Tube and Components): 1. Rimguard and Aquadag added. 2. R418 re-positioned.

Modifications (Line Output Circuits): 1. R418 10k added. V402 grid circuit. 2. R415 was 1 MΩ, now 4·7 MΩ. 3. R417 (2·7k, 2W) added across L40. 4. C414 was 2·5 μF. now 3·3 μF. 5. V401 was incorrectly shown as PL505, now PL509.

Modifications (Scanning and Convergence Wiring): Orange lead on yolk re-positioned.

Modifications (Convergence Panel Lay-out): Control functions of potentiometers now labelled. Previously omitted.

Modifications (Convergence Panel Circuit): 1. VR503 was 50 ohms, now 75 ohms. 2. VR504 was 50 ohms, now 75 ohms. 3. VR507–VR508 incorrectly designated. Should read VR507–VR508 Red Green Vertical Left. 4. VR510–VR511 incorrectly designated. Should read Blue Horizontal Central One.

DYNATRON — Colour Television Chassis

General Description: This model is electrically similar to the Pye CT70 chassis, which is described later in the colour television section of this volume.

EKCO — Models CT102 and CT104

General Description: These models are electrically similar to Pye CT70 and CT71. These 19-in. and 23-in. models are fully described in this volume.

FERRANTI — Model CT1166

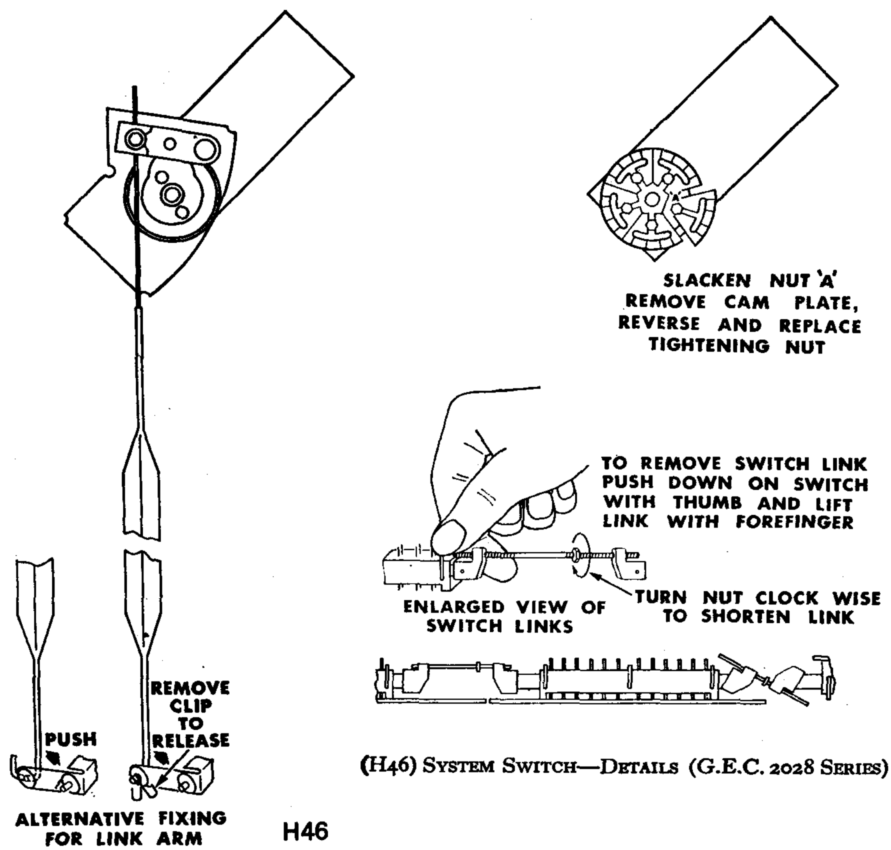
General Description: This model is electrically similar to the Pye CT70 chassis, which is described in this volume. The CT70 is a 23-in. console model and full details are given at the end of the colour television section.

G.E.C. Models 2028, 2028A, 2029, 2029A, 2030, 2030A

General Description: Service information for these models was given on pages 56 to 65, in the 1967–68 volume. Here, some extra information is given from the latest service manuals and supplements; it may be necessary to refer to the above volume, in order to completely cover some servicing instructions, in addition to the following material.

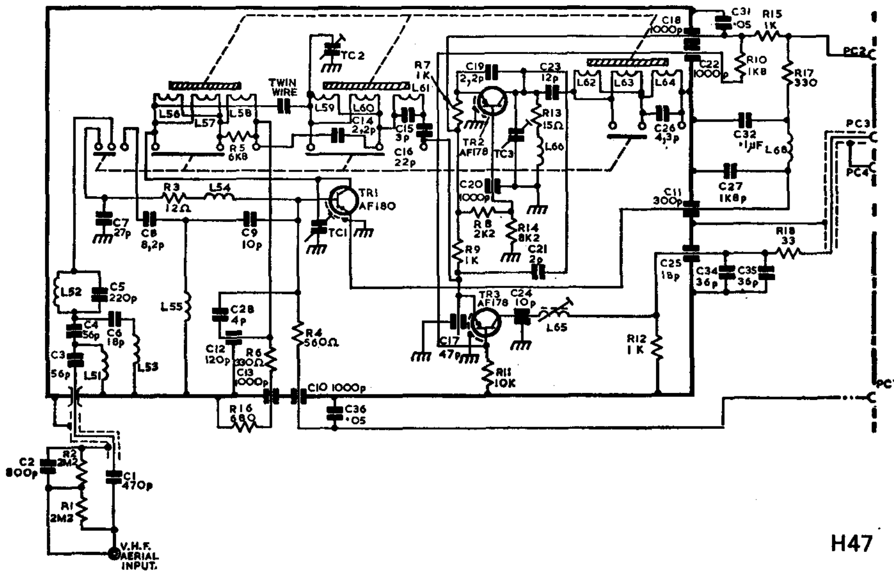
Mains Input: These receivers are designed for operation between 230 V and 245 V. For 250 V operation, add 4 Ω in series with R48, this extra resistance being an 8 W rating (minimum). For operation below 230 V and above 250 V an autotransformer rated at 500 W should be used.

Moiré Patterns: To a certain extent, Moiré patterns are present on all shadow-mask type cathode ray tubes. On a percentage of these tubes, which have a small spot size, the effect becomes objectionable. To improve this



(H46) System Switch—Details (G.E.C. 2028 Series)

H46

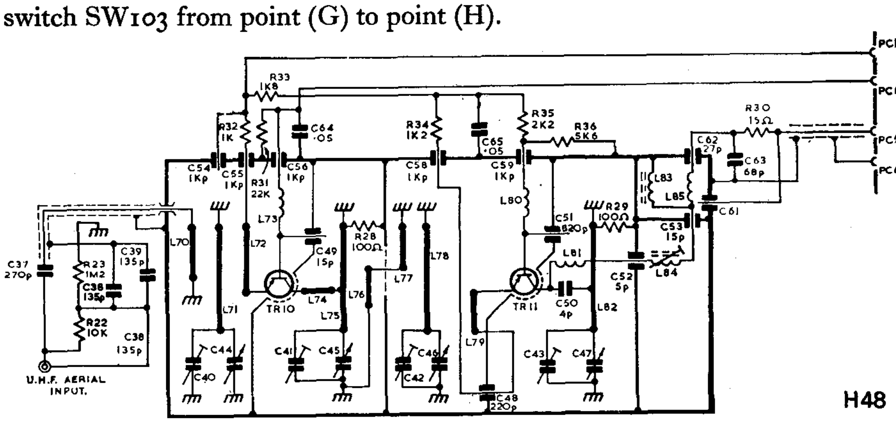


(H47) Circuit Diagram of V.H.F. Tuner M96931 (G.E.C. 2028 Series)

condition reduce the A1 (screen) voltage of the gun which is at the highest potential (450 V minimum): usually the red gun. Reset the blue and green screen potentials as under "grey scale setting", with respect to the lower screen voltage. The optimum focus should be adjusted in the highlight area of the picture.

625 Line Reception on V.H.F. (Wired Systems): Disconnect all U.H.F. tuner leads from I.F. panel, i.e. the I.F. output lead to PC5 and its earth, the L.T. lead (red) to PC1, and the A.G.C. lead (yellow) to PC8.

Short circuit the V.H.F. tuner H.T. from PC2 to PC2A. Short circuit A.G.C. switch SW103 from point (G) to point (H).

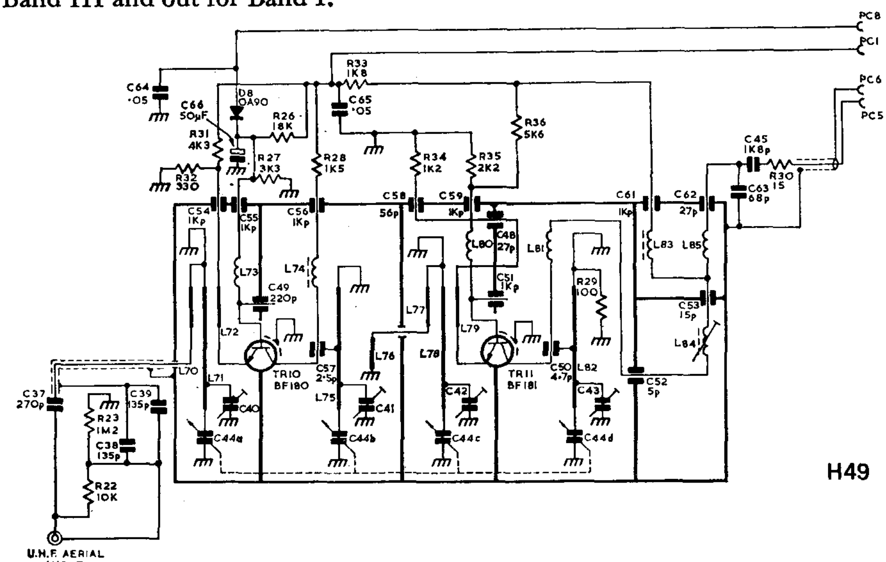


(H48) Circuit Diagram of U.H.F. Tuner M95928 (G.E.C. 2028 Series)

Note: With receivers prior to the introduction of the "A" series (using germanium U.H.F. tuners), remove the V.H.F. tuner A.G.C. lead (green) from PC7 and connect to PC7A.

Remove the V.H.F. tuner I.F. output lead from PC3 and connect to PC3A. Remove the 36 pF capacitor (C34 or C35) on V.H.F. tuner I.F. output lead.

The U.H.F. position of the channel selector switch may still be used, as it is possible to tune to any V.H.F. channel (Band I or III) with the fine tuner, provided the band switch is actuated correctly. This is a function of the "wavy" plates (V.H.F. tuner rear and examination will show that it is quite simple to reverse the plate to select the required band. (Loosen the screw only to lift out the plate.) The actuating fork will be in (towards the front of the receiver) for Band III and out for Band I.



(H49) Circuit Diagram of U.H.F. Tuner M95932 (G.E.C. 2028 Series)

U.H.F. Tuner (Germanium): Part number M95928 to be used in conjunction with I.F. panel M96943 (PC350/1/2/3). These units are direct replacements; fit as supplied.

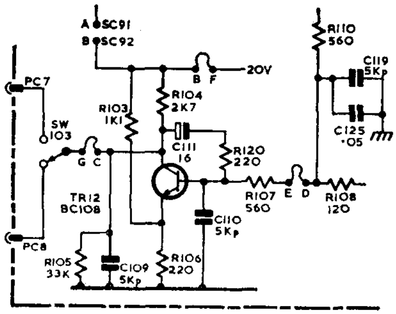
U.H.F. Tuner (Silicon): Part number M95932 to be used in conjunction with I.F. panel M96943 (PC350/1/2/3). Circuit changes are as follows:

(*a*) Remove flying lead from PC7A (system switch) and the junction of R104/R105 (G to C).

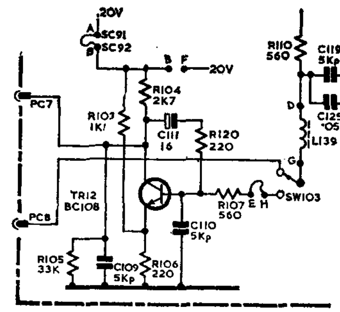
(*b*) Transfer green A.G.C. lead (V.H.F. tuner) from PC7 on system switch SW103 to (C) junction of R104/R105.

(*c*) Remove R107 (560 ohms in can 648/PC321) re-route between C110/R120 and PC7, 405 pole of SW103 (H).

(*d*) Connect wire link from junction of R108/R110 (D) to PC7A centre wiper of SW103 (G)



H50



H51

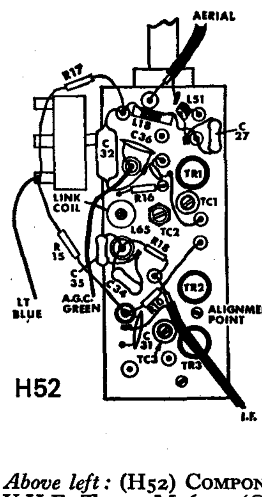
Left: (H50) A.G.C. Interconnections for I.F. Panel Used With Germanium Tuners (G.E.C. 2028 Series)

Right: (H51) Those Used With Silicon Tuners (G.E.C. 2028 Series)

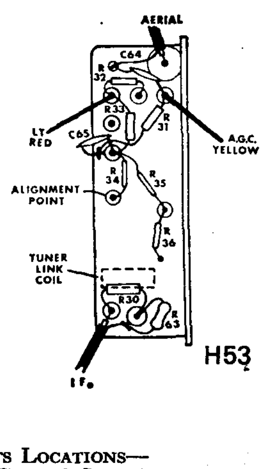
(*e*) Remove 625 H.T. supply to TR12 by cutting print leading from junction of R103/R104 at a point adjacent to PC6 (earth tag) and connect wire link from junction of R103/R104 to PC2 (405 pole of SW106).

U.H.F. Tuner (Germanium): Part number M95928 to be used in conjunction with I.F. panel M96979 (PC350/4). Circuit changes are as follows: Remove links A–B, D–G, E–H. Refit links between B–F, E–D, G–C. Reconnect black flying lead (C.R.T. base) from PC12 on system switch to PC12 amp tag adjacent to SW111.

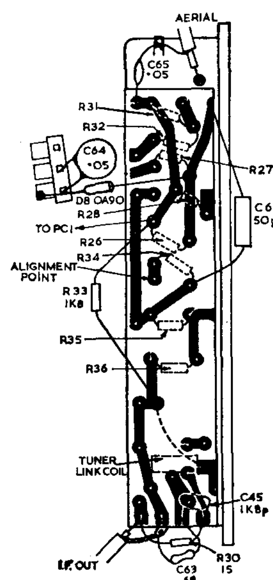
U.H.F. Tuner (Silicon): Part number M95932 to be used in conjunction



H52



H53



Above left: (H52) Components Locations—V.H.F. Tuner M96931 (G.E.C. 2028 Series)
Above right: (H53) Component Locations—U.H.F. Tuner M95928 (G.E.C. 2028 Series)
Right: (H54) Component Locations—U.H.F. Tuner M95932 (G.E.C. 2028 Series)

H54

with I.F. panel M96979 (PC350/4). These units are direct replacements, fit as supplied; i.e. links between A–B, D–G, E–H.

Note: Reconnect green A.G.C. lead (V.H.F. tuner) from PC7 on system switch SW103 to (C) junction of R104/R105.

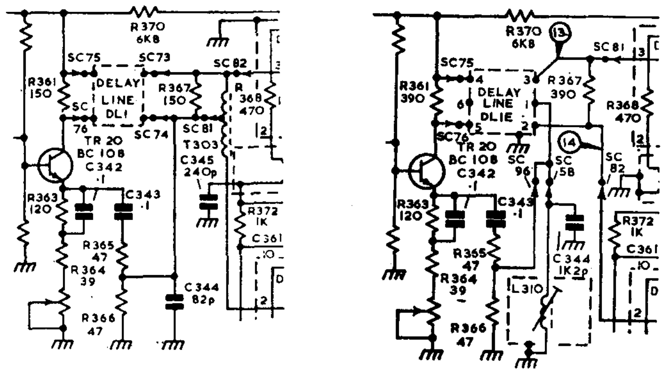
Note: Identification of U.H.F. tuners in situation is possible, as the silicon type tuner employs an OA90 diode mounted to the rear of the tuner.

Typical Fault Conditions: The table below gives some typical faults and checking procedure for same:

Fault	*Check*
Excessively severe Hanover Blinds with incorrect colour	Bistable circuit, in particular TR32/33, D314/315, D309/D310
Colour, but predominantly blue–yellow	Check (R–Y) demodulator is receiving reference and signal Check (R–Y) video pre-amp. TR21, output valve V7A/B
Colour, but predominantly red–cyan	Check (B–Y) demodulator is receiving reference and signal Check (B–Y) video pre-amp. TR23 and output valve V9A/B Check setting of C346 (set B–Y phase)
Hue changes when saturation control is increased	Check operation of clamps, V7B, V8B, V9B. Check that the burst is being blanked in D310/302
Colour occasionally slips into incorrect conditions, i.e. reds and cyans become changed over on colour bar signal	Check tuning of L308 and presence of identification signal at junction C351/R352. Check bistable circuit
Insufficient saturation when colour control is at maximum	Check setting of A.C.C. control (receiver correctly tuned) Check setting of killer threshold control (see under internal preset controls) Check C305

Revised Pre-set Contrast Adjustments: This adjustment is best carried out under low ambient lighting conditions. It is essential that the 625 pre-set contrast control is adjusted first, as this will have an effect on the setting of the 405 contrast. 1. Switch to 625, and turn manual contrast control to maximum. Adjust 625 pre-set control (P103) for an over-contrasted picture. Note that excessive contrast will cause shading or loss of picture synchronisation. 2. Switch to 405, and turn manual contrast control to minimum. Adjust 405 pre-set control (P101) to maximum and turn down slowly until there is a drop in contrast, this is the correct setting.

Voltage and Current Measurements (Valves): Notes: 1. Supply voltage 240V 50Hz. 2. Avo model 8. 3. VI–VII, normal signal applied, controls correctly adjusted for a normal picture. 4. V2 values depend on control settings. 5. Anode voltages of V7b, V8b and V9b vary from 5–110V and cathode voltages from 0–110V, as background control is turned from minimum to maximum. These values must be measured on 250V (or higher) range.



Left: (H55) Part of Decoder Circuit—Early Models. Note that SC81 and SC82 References Should be Transposed (G.E.C. 2028 Series)
Right: (H56) Part of Decoder Circuit—"A" Series Models (G.E.C. 2028 Series)

Valve		*Function*	*Va* 405	*Va* 625	*Vg2* 405	*Vg2* 625	*Vk* 405	*Vk* 625	*Ik (mA)* 405	*Ik (mA)* 625
V1a	PCL86	Sound output	275	280	235	230	5·4	5·4	42	39
V1b		Sound amplifier	120	120	–	–	0	0	0·6	0·6
V2	PL802	Luminance output	185	175	250	240	0·9	1·0	30	30
V3a	PCF80	Sync. separator	165	235	115	120	0	0	1·7	1·4
V3b		Frame pulse clipper	18	15·5	–	–	0	0	2·6	2·6
V4a	PCF802	Line oscillator	280	270	–	–	8·4	7·8	2·4	2·3
V4b		Line oscillator	185	185	270	270	8·4	7·8	9·8	9·1
V5a	ECC82	Frame multivibrator	27	27	–	–	0	0	0·5	0·5
V5b		Frame multivibrator	90	87	–	–	0	0	8·3	8·1
V6	PL508	Frame output	260	260	230	230	21·5	21·5	70	70
V7a	PCL84	Chroma. output (R–Y)	170	175	168	168	2·5	2·6	23	24
V7b		Chroma. clamp (R–Y)	60		–	–	57		0·2	0·2
V8a	PCL84	Chroma. output (G–Y)	170	176	168	168	2·7	2·7	27	27
V8b		Chroma. clamp (G–Y)	60		–	–	57		0·2	0·2
V9a	PCL84	Chroma. output (B–Y)	170	177	168	168	2·4	2·5	24	24
V9b		Chroma. clamp (B–Y)	60		–	–	57		0·2	0·2
V10	PY500	Boost diode	290	290	–	–	H.V.	H.V.	–	–
V11	PL509	Line output	H.V.	H.V.	270	265	2·8	2·9	220	245

Voltage and Current Measurements (Main Voltages): Notes: 1. Supply voltage 240 V 50 Hz. 2. Avo model 8. 3. Values for C.R.T. focus electrodes depend on control settings.

Power supplies	*405 (V)*	*625 (V)*	*Power supplies*	*405 (V)*	*625 (V)*
H.T. 1	290	290	H.T. 4	230	230
H.T. 2	278	278	L.T. 5 (anode D701)	−20	−20
H.T. 3	278	278	L.T. 6 (mixer and osc. feed)	12	—
L.T. 1 (+20 volt line)	20	20	L.T. 7 (U.H.F. tuner L.T. feed)	—	12
L.T. 2 (+27 volt line)	27	27	E.H.T. (zero beam current)	25k	25k
L.T. 3 (colour beacon)	28	11	Boost H.T.	790	810
L.T. 4 (cathode D701)	21	21	C.R.T. focus electrodes	4·3k	4·3k

Voltage and Current Measurements (Transistors): Notes: 1. 20 V L.T. supply. 2. Avo model 8. 3. TR1 to TR11, no signal input, contrast at maximum. 4. TR12 to TR14, normal signal applied, pre-set contrast at maximum. 5. TR15 to TR16, no signal input, contrast at maximum. 6. TR17 to TR33, colour signal applied, test card F(625). 7. The collector values for TR34 depend on control settings. 8. TR27 values depend on control settings. 9. TR20 base and emitter values depend on control settings.

Transistor	*Function*	*Collector*		*Emitter*		*Base*	
		405	*625*	*405*	*625*	*405*	*625*
TR1 —AF180	V.H.F. R.F. amp.	2	—	17·0	—	16·5	—
TR2 —AF178	V.H.F. local osc.	—	—	—	—	—	—
TR3 —AF178	V.H.F. mixer	2	—	—	—	9·8	—
TR4 —BF167	1st common I.F. amp.	16·3	16·5	1·4	1·4	2·0	2·0
TR5 —BF167	2nd common I.F. amp.	14·3	14·5	2·8	2·8	3·5	3·5
TR6 —BF173	Vision I.F. amp.	14·0	14·2	1·1	1·1	1·7	1·7
TR7 —BF194	Video phase splitter	19·5	20·0	0·2	0·1	0·9	0·8
TR8 —BF194	Emitter follower	19·8	20·1	5·2	5·3	5·9	6·0
TR9 —BC187	Video clipper	3·2	0·7	19·8	20·0	18·0	18·3
TR10 —BF180	U.H.F. R.F. amp. Si	—	15·5	—	2·3	—	3·0
TR11 —BF181	U.H.F. mix. osc. Si	—	12·5	—	2·9	—	3·4
TR10/G—AF186	U.H.F. R.F. amp. Ge	—	0	—	17	—	16·5
TR11/G—AF186	U.H.F. mix. osc. Ge	—	—	—	8·5	—	8·5
TR12 —BC108	A.G.C. delay	18·4	16·5	3·5	3·3	1·9	1·8
TR13 —BC187	A.G.C. amp.	2·0	1·9	19·7	19·0	19·1	18·8
TR14 —BC108	A.G.C. sampler	19·1	18·8	1·15	1·15	0	0
TR15 —BF194	2nd sound I.F. amp.	10	10	3·0	3·0	3·6	3·6
TR16 —BF194	1st sound I.F. amp.	16·5	12	1·1	1·7	1·5	2·2
TR34 —BC108	Beam current limiter	8·5–11	8·5–11	2·7	2·7	2·7	2·7

Decoder Measurements Taken With a Colour Signal Input

Transistor	*Function*	*Collector*	*Emitter*	*Base*
TR17—BC108	Blanking switch	0·45	0	0·66
TR18—BF194	1st chroma amplifier	19·25	0	0·6
TR19—BF194	2nd chroma amplifier	17·8	5	5·5
TR20—BC108	Delay-line driver	20·0	1·8	2·4
TR21—BF194	R–Y pre-amplifier	13·0	0·6	0
TR22—BF194	G–Y pre-amplifier	15·0	0·6	0
TR23—BF194	B–Y pre-amplifier	12	0·6	0
TR24—BF194	Chroma amplifier	19·7	1·1	1·7
TR25—BF173	Burst amplifier	20·0	0·6	0·2
TR26—BC107	Beacon switch	0·2	0	0·8
TR27—BC108	D.C. amplifier	14–19	0·1–0·4	0·5–0·8
TR28—BF194	Subcarrier oscillator	14·0	3·2	3·6
TR29—BC108	Subcarrier buffer	14·0	1·8	2·3
TR30—BC107	7·8 Kc/s amplifier	18·6	3·4	3·8
TR31—BC108	7·8 Kc/s buffer	18·6	9·5	8·0
TR32—BC108	Bistable	7·5	0	0·4
TR33—BC108	Bistable	7·5	0	0·4

Models 2028, 2029 and 2030

Field Jitter: Disconnect the bottom end of C522 from pin 7 of V6. Reconnect to chassis.

Height Variations: If C522, C523 and C528 are Hunts type G3051H capacitors, replace with the equivalent value of another type.

Field Creep from Bottom: Check PL508 valve. Replace R534 with a 470 Ω 2 W resistor. Replace R43 with a 5k 6 Ω 1 W resistor.

No Colour or Intermittent Colour Reference Oscillator: Capacitors C305 (100 pF), C323 (390 pF), C324 (560 pF), C325 (560 pF), and C326 (180pF) are suspect for these symptoms. Replace with equivalent value of another type.

Cross Colour on Corner Gratings. Test Card F: Add filter coil assembly (L309—part number M93501) in parallel with R302. Replace R302 with a 100Ω ½W resistor.

Colour Sub-carrier no Coincident with Correct Tuning: Early Production 2028: Add 6 MHz filter coil assembly (L138—part number 94716) between the junction of TR7–L116 and connection point 8 input to decoder panel.

Tuneable Hum, 405 Only: Check the revised pre-set contrast adjustments. On some early receivers L137 (part number 93501) was omitted. This can be established by the tab, which protrudes from the top of the assembly T113. If the number 650 is printed on this tab, then L137 has been fitted. Where this filter is not fitted, it may be added in series with the inner conductor of the coaxial cable connecting T113 to SW108 located on the underside of the plated panel.

Value Changes: To improve performance the following changes were made to this series of receivers.

Circuit reference	*Original value*	*New value*	*Circuit reference*	*Original value*	*New value*
R48	4Ω	6Ω	R156	2k7Ω	1k5Ω
R100	2k7Ω	1k5Ω	R158	4k7Ω	3k5Ω
R101	2k2Ω	Delete	R178	8k2Ω	1kΩ
R125	10kΩ	18kΩ	R186	330kΩ	680kΩ

Notes: A spark gap (SG9) has been added between pin 6 of SK/PL9 and chassis, beneath the time base panel. C180 (1k 8pF) has been added between SW109 (625 pole) and chassis. C341 (0·002 μF) becomes 0·047 μF.

625 Line Reception on V.H.F. (Wired Systems): Early production models fitted with germanium U.H.F. tuners:

Connections for:	*Standard*	*Translated*
U.H.F. I.F. (co-axial inner) . .	PC5	Disconnect and isolate
U.H.F. I.F. (co-axial screen) . .	PC6 (chassis)	
U.H.F. H.T. lead (red) . . .	PC1	
U.H.F. A.G.C. lead (yellow) . .	PC8	
V.H.F. H.T. lead (blue) . .	PC2	PC2A
V.H.F. A.G.C. lead (green) . .	PC7	PC7A
V.H.F. I.F. (co-axial inner) . .	PC3	PC3A
C34 (56 pF)	Fitted on V.H.F. tuner	Remove

Notes: The V.H.F. channel switch should be set to the U.H.F. position and may then be tuned to any V.H.F. Band I or Band III channel by means of the fine tuner. As dispatched from the factory this is in the Band I position. Should reception be required on Band III it will be necessary to reverse the "wavy" plate (rear of V.H.F. tuner) which actuates the band switch. To do this, loosen the screw which holds the plate, lift out and reverse, then tighten the screw. The actuating fork will be in (towards the front of the receiver) for Band III and out for Band I.

Models 2028A and 2029A

Bent Verticals: Fit a 33 Ω ½W resistor (R66) in parallel with C85 (1 μF located on line output transformer).

Vertical Striations (left-hand side of picture): Fit a 390 Ω resistor directly across L607 (R and G symmetry coil). Later versions using a modified coil assembly and a 1 kΩ resistor (R611) in parallel do not require this change. If this proves ineffective, suspect T4 (line output transformer).

Colour Saturation: To increase the effective range of colour control (P1) fit a 1k 5Ω resistor (R360) across the secondary of T306 (1st burst amplifier coil assembly).

Colour Definition: To improve colour definition and reduce colour smearing to the right of objects, fit an 820 pF capacitor across R374 (8k 2Ω) and a 1k 2pF capacitor across R392 (8k 2Ω).

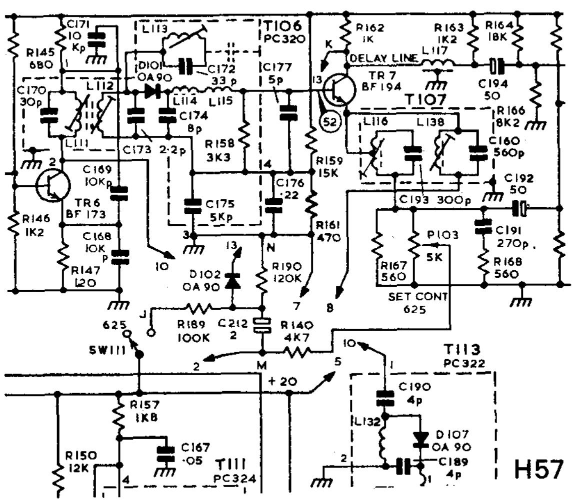
Sound Distortion:

Channel affected	*Circuit reference*	*Original value*	*New value*
405/625	R154	330kΩ	100Ω
405	R137	12kΩ	27kΩ
625	R179	12kΩ	22kΩ

Corner Corrugation Effect: This symptom indicates that R540 (390 Ω) has changed value or may be o/c.

Spasmodic Vision Interference (405): Later production models have incorporated a noise cancellation circuit, see diagram H57 for details.

R and G Tilt: To increase the effective range of P608, change the value to 250 Ω or insert a 100 Ω resistor in series between P608 and C602. To increase the effective range of P609, change the value to 500 Ω or insert a 100 Ω resistor in series between P609 and C604.



(H57) Noise Cancellation Circuit—D102, etc. (G.E.C. 2028 Series)

Blue Amp and Blue Tilt: Subsequent to convergence panel replacement, it may be necessary to transpose connections 1 and 4 on the blue convergence coil assembly (see circuit diagram) in order to provide adequate adjustment of P605 (blue tilt) and P600 (blue amp) contols.

Value Changes: To improve performance the following changes were made to this series of receivers.

Circuit reference	Original value	New value	Circuit reference	Original value	New value
R161	470Ω	560Ω	R810	680Ω	2k2Ω
R379	3k3Ω	4k7Ω	C700	0·47μF	0·33μF
R808	680Ω	2k2Ω	C701	0·47μF	0·33μF
R809	680Ω	2k2Ω	C703	1k2pF	1kpF*

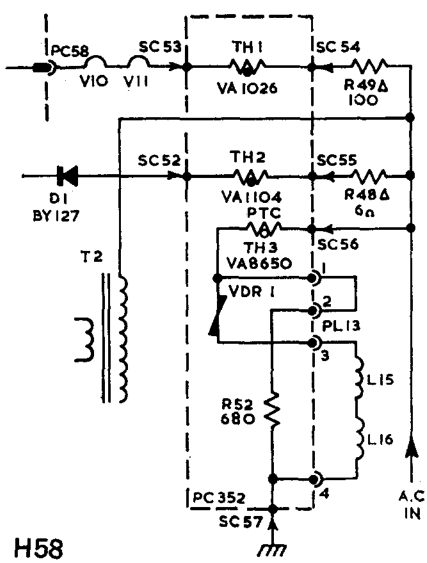
* When this value of capacitor is fitted, SW707 (405 pole) is earthed.

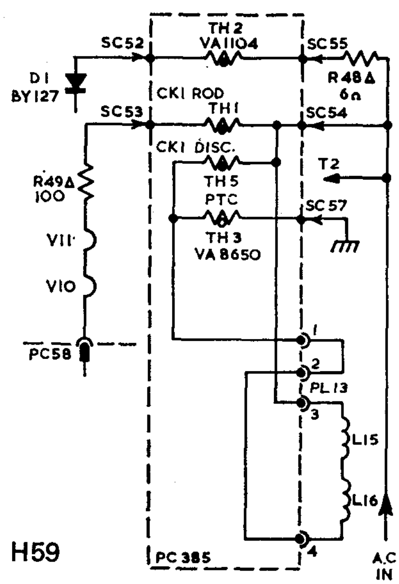
Notes: A 12kΩ resistor has been added between R513 (220 Ω) and H.T. The junction of these two resistors is decoupled by a 4μF 300V capacitor to chassis. The +18V and −18V pulse lines from T4 now have an 82Ω resistor in series. The +80 pulse line has a 1kΩ resistor in series.

Models 2028B and 2029B

Magnetic Screen Assembly: This assembly uses different degaussing coils (L15 and L16) which *must only* be used with compatible H.T. dropper and mains degaussing panel assemblies.

625-line Reception on V.H.F. (Wired Systems): Models fitted with silicon U.H.F. tuners: These tuners can be identified by a 50μF capacitor and an OA90 diode which are mounted to the rear of the tuner.





(H58) Mains and Degaussing Panel: *left:* Early Models and "A" Models (G.E.C. 2028 Series)

Right: (H59) "B" Models (G.E.C. 2028 Series)

E

Connections for:	*Standard*	*Translated*
U.H.F. I.F. (co-axial inner) . .	PC5	Disconnect and Isolate
U.H.F. I.F. (co-axial screen) . .	PC6 (chassis)	
U.H.F. H.T. lead (red) . . .	PC1	
U.H.F. A.G.C. lead (yellow) . .	PC8	
V.H.F. H.T. lead (blue) . .	PC2	Add link between PC2–PC2A (underside of panel)
V.H.F. A.G.C. lead (green) . .	PC7	Add link between G–H (underside of panel)
V.H.F. I.F. (co-axial inner) . .	PC3	PC3A
C34 (36 pF)	Fitted on V.H.F. tuner	Remove

Notes: The V.H.F. channel switch should be set to the U.H.F. position and may then be tuned to any V.H.F. Band I or Band III channel by means of the fine tuner. As dispatched from the factory this is in the Band I position. Should reception be required on Band III it will be necessary to reverse the "wavy" plate (rear of V.H.F. tuner) which actuates the band switch. To do this, loosen the screw which holds the plate, lift out and reverse, then tighten the screw. The actuating fork will be in (towards the front of the receiver) for Band III and out for Band I.

Circuit Diagram Errors: The circuit diagram on pages 62–64 in the 1967–68 volume contained incorrect information. Advice is given below regarding these, and the manufacturers apologise for any inconvenience caused.

1. C310 should red 18 pF.
2. SW704 wiper should be in 625 position.
3. In later production models when C703 is 1000 pF, SW707 is switched to chassis in 405 position, and not to point 27.

INVICTA — Model CT 7050

General Description: This model is electrically similar to the Pye CT70 chassis, which is described in this volume.

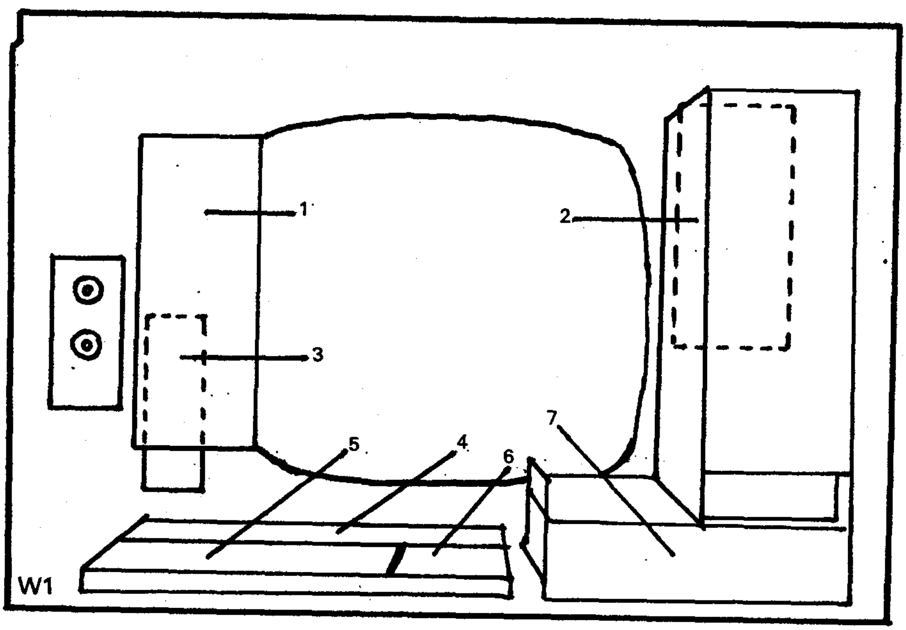
MASTERADIO — Model 4030A

General Description: This model is covered by the information given on the G.E.C. models 2030 and 2030A, in this and the 1967–68 volume. Such information is presented in a manner which can be easily assimilated by reference to either or both volumes.

PYE Models CT70 and CT71

General Description: The information given relates to all receivers which contain the Pye Group "hybrid" dual-standard colour television chassis. CT71 is a 19-in. table model with rotary tuner, four front controls and automatic A.F.C. switching. CT30 is a 23-in. console with pushbutton tuner, six front controls and manual A.F.C. switching. The receivers are designed for reception of both colour and monochrome pictures on 625-lines; also monochrome pictures on 405-lines. For colour reception the P.A.L. D system with a glass delay line in the decoder is employed, enabling high quality colour pictures to be obtained with easier tuning. They are fitted with a Mullard rectangular shadow mask colour C.R. tube, which is automatically degaussed each time the receiver is switched on. The front-facing convergence panel system switch is directly coupled to the tuner mechanism, whilst the I.F. and line timebase switches are solenoid-operated. For easy servicing the chassis is of unit construction, made up of the main chassis consisting of the horizontal timebase and E.H.T. supply, and receiver power supplies. Seven easily detachable, pluggable sub-units made up the rest of the receiver, these being:

1. Silicon transistorised multi-band tuner, fitted with A.F.C. on U.H.F.

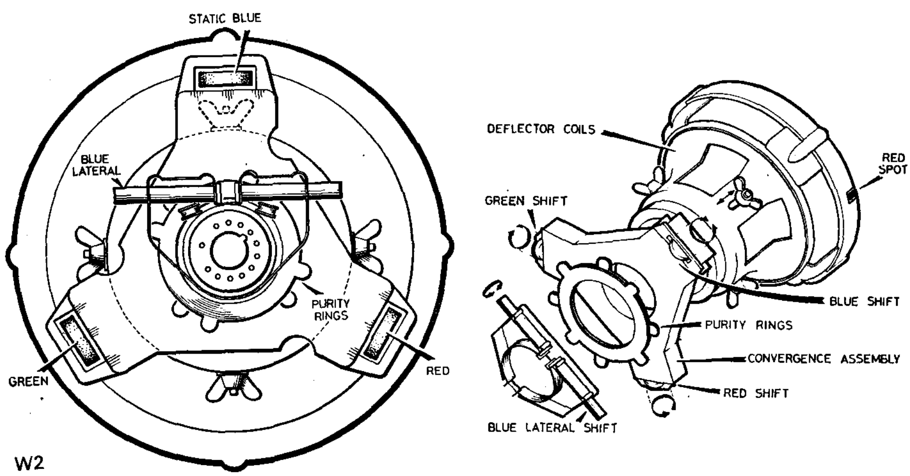


(W1) Location of Sub-units. *Key:* 1. I.F. Panel; 2. Convergence Panel; 3. Control Panel; 4. Decoder Panel; 5. Luminance and Colour Difference Amplifier Panel; 6. Frame Timebase Panel; 7. Line Timebase and Power Supplies (Pye CT70 and CT71)

2. Fully transistorised vision and sound I.F. panel, including luminance pre-stages, A.G.C., synchronization separator and A.F.C. discriminator.
3. Fully transistorised decoder panel, including A.C.C.
4. Fully transistorised vertical timebase panel.
5. Customer control panel including fully transistorised sound output panel.
6. Valve luminance amplifier and colour difference amplifier panel.
7. Front facing convergence panel discreetly concealed behind cabinet aperture.

Mains Supply: The receiver is designed for operation from an A.C. supply of 240V ± 10 per cent. Operating the receiver outside these limits or from an isolation transformer which provides poor voltage regulation may give rise to difficulty in obtaining optimum convergence. Under no circumstances connect to a D.C. supply or serious damage will result. Before connecting the receiver to the mains, remove the back cover and ensure that all valves and connectors are secure.

Fuse: A 2·5 amp delay-type fuse is fitted in the mains input circuit.



(W2) C.R.T. Neck Assembly (Pye CT70 and CT71)

Horizontal Hold 405 and 625: A common horizontal hold control is provided for both 405- and 625-line operation.

405 and 625 Pre-set Horizontal Holds: These controls are provided to allow the common 405/625 horizontal hold control to operate in the centre of its range on both systems. To adjust, place the common line hold control to the centre of its range, switch to 625 and lock in a steady picture by adjusting the 625 pre-set hold control. This control is a small variable inductor located on the side of the line timebase. Next switch to 405 and lock in a steady picture by adjusting the 405 pre-set hold control, which is a small trimmer capacitor also located on the side of the line timebase.

Focus: The focus control is common to both 405- and 625-line operation

and the system switching takes this into account. The focus should be adjusted for best overall focus.

Adjusting for Purity: Purity should be adjusted on a plain red raster of average brightness.

1. The convergence controls are situated above the loudspeaker at the left-hand side. Access is obtained by giving the chrome screw one half-turn, when the panel will spring forward, allowing easy removal and access to the forward facing screen and convergence controls.

2. Loosen the four wing-nuts which are located on the sides of the deflector coil housing and slide the deflector coils forward to the full extent of the movement (i.e. towards the flare of the C.R.T.).

3. Switch off the green and blue guns by operating the switches marked "green screen" and "blue screen"; these are located at the top of the convergence panel.

4. By adjusting the purity magnets bring the red area to the centre of the screen.

5. Move the deflector coils backwards until the whole screen area is red and pure. Too great a movement will again contaminate the edges of the screen.

6. Switch on the green gun only and check that the whole screen area is green, then switch on the blue gun only and check that the whole screen area is blue. Very slight adjustment of the purity magnet and the position of the deflector coils may be necessary to reach a compromise between red, green and blue rasters.

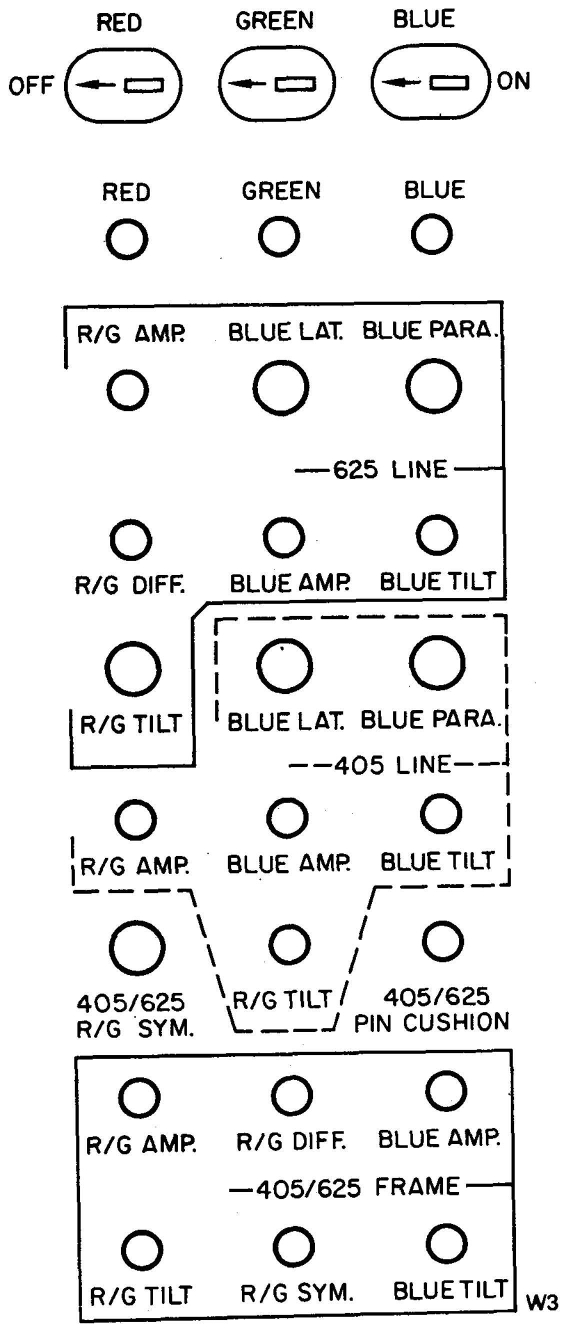
Note: It is impossible to obtain good purity if the static convergence of the three beams is badly maladjusted. Best results are obtained by first getting the static convergence approximately correct and then adjusting for purity, alternating between the two sets of adjustments. Should the deflector coil assembly be removed, it must be re-fitted with the red painted spot inclined towards the top right-hand side of the cabinet.

Static Convergence: To carry out the convergence of a colour television receiver a crosshatch pattern generator is essential. It should produce a pattern comprised of approximately twenty vertical and fifteen horizontal clearly defined thin lines on a black background. The output should preferably be at V.H.F. and U.H.F. to enable the signal to be connected to the receiver aerial socket.

Static Convergence Adjustments: (To be carried out in a semi-darkened room). The following controls must have previously been correctly adjusted: width; height; vertical and horizontal linearity; vertical and horizontal shift; purity.

1. Switch the receiver to U.H.F./625-line operation and connect the crosshatch generator to the U.H.F. aerial socket. Switch the receiver on, and adjust the receiver or generator tuning to obtain a sharp clearly defined crosshatch pattern.

Note: The receiver should be switched on for at least twenty minutes before convergence is attempted and should have previously been degaussed.



(W3) Convergence Panel (Pye CT70 and CT71)

2. Switch off the blue gun by operating the switch marked "blue screen" which is located at the top of the convergence panel.

3. Adjust the red and green static convergence magnets to cause the red and green vertical and horizontal lines (crosshatch) to merge into single yellow lines at the centre of the screen.

4. Switch on the blue gun and adjust the blue static convergence magnet to cause the blue horizontal line to merge with the yellow and produce a single white line at the centre of the screen.

5. Adjust the blue lateral magnet to cause the blue vertical line to merge with the yellow to produce a single vertical white line at the screen centre. Rotate the rod magnet only, not the complete lateral magnet assembly on the neck of the C.R.T.

Note: Do not concentrate on a large central area of the screen when carrying out adjustments for static convergence. The most central intersection of a horizontal and vertical line will suffice.

6. For optimum results repeat adjustments for purity and static convergence.

Note: It may be found that a dot pattern is preferred by some when carrying out static convergence adjustments. If this pattern is used the most central group of red, green and blue dots should be made to converge into a single white dot. The controls should be adjusted in the same sequence as indicated in steps 2–5.

Dynamic Convergence (625 lines):

1. Switch the receiver to U.H.F./625 operation and connect the crosshatch generator to the U.H.F. aerial socket. Switch the receiver on and adjust the receiver or the generator tuning to obtain a sharp clearly defined crosshatch pattern. The receiver should be switched on for at least twenty minutes before convergence is attempted.

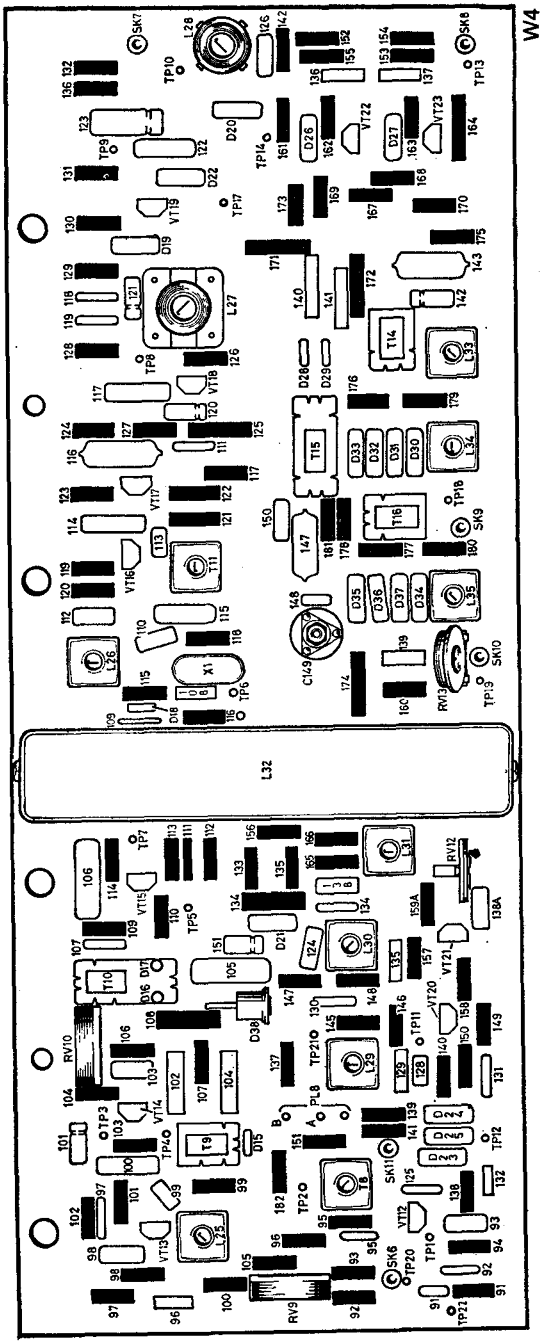
To Converge Red and Green (Blue Gun Off):

2. Adjust R/G frame amplitude and R/G frame tilt controls to cause the centre vertical red and green lines to be superimposed and form a yellow line, or made parallel. This is best achieved by adjusting the R/G frame tilt to make the spacing between the top and bottom halves of the centre vertical red and green lines equal and then adjust the R/G frame amplitude to make them superimposed or parallel, alternating these two adjustments for optimum results.

3. Adjust R/G frame difference control to converge the horizontal red and green lines at the top centre of the screen. Next, adjust R/G frame symmetry control to converge all the horizontal red and green lines down a centre line over all the screen.

4. Adjust 625 R/G amplitude control to converge red and green vertical lines down the left side of screen. Adjust 405/625 R/G tilt control to converge red and green lines down the right side of screen.

5. Adjust 405/625 R/G difference control to straighten out any bowing of the horizontal red and green lines at the top and bottom of the screen. If the



(W4) Component Layout—Decoder With DL1E Delay Line (Pye CT70 and CT71)

red and green horizontal lines cross over each other they should be made parallel or converged by adjusting 405/625 line symmetry control.

6. Readjust red and green static convergence and for optimum results repeat steps 1–5 to converge red with green overall and thus produce a yellow crosshatch.

To Converge Blue with Yellow: Switch on the blue gun and carry out the following instructions to converge blue with yellow to produce a white crosshatch.

7. Adjust blue frame tilt control to converge blue and yellow horizontal lines at the bottom centre of the screen. Adjust blue frame amplitude control to converge blue and yellow horizontal lines at the top centre of the screen.

8. Adjust 625 blue amplitude to straighten out any drooping of horizontal blue lines, thus causing them to be parallel to, or converged with the yellow lines. If, however, the blue and yellow horizontal lines cross over each other they should be made parallel to, or converged by adjusting 625 blue tilt control. It may not be possible to converge the blue and yellow horizontal lines along their entire length until step 9 has been carried out.

9. If there is any undulation of the blue horizontal lines after carrying out step 8 these should be straightened out by adjusting 625 blue parabola control. Alternate steps 8 and 9 until blue and yellow horizontal lines are converged.

10. Adjust 625 blue lateral control to converge the vertical blue and yellow lines at the left and right sides of screen.

11. For optimum results readjust blue static convergence and repeat steps 7–10 to converge blue with yellow overall and thus produce a white crosshatch.

Dynamic Convergence (405 lines): The static convergence blue lateral shift magnet and those controls used in steps 1–11 of 625 convergence must not be altered during 405-line convergence adjustments.

12. Switch the receiver to V.H.F./405 operation and connect the crosshatch generator to the V.H.F. aerial socket and adjust the tuning of the receiver or generator to obtain a sharp clearly defined crosshatch pattern.

13. Switch off the blue gun, leaving red and green guns switched on.

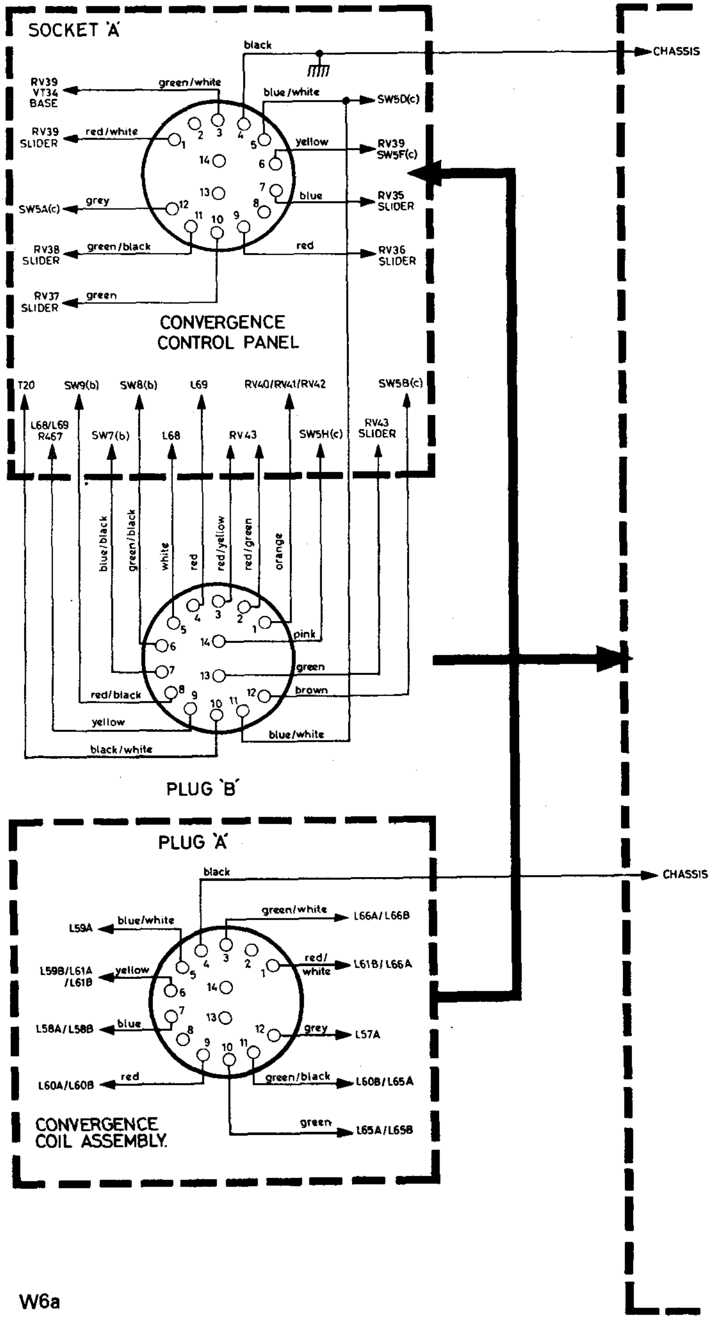
14. Adjust 405 R/G amplitude control to converge all vertical red and green lines, producing a yellow crosshatch.

Note: It may be necessary to adjust the 405 pre-set R/G tilt to remove any errors on the right-hand side of the screen.

To Converge Blue with Yellow: Switch on the blue gun and carry out the following instructions to converge blue with yellow to produce a white crosshatch.

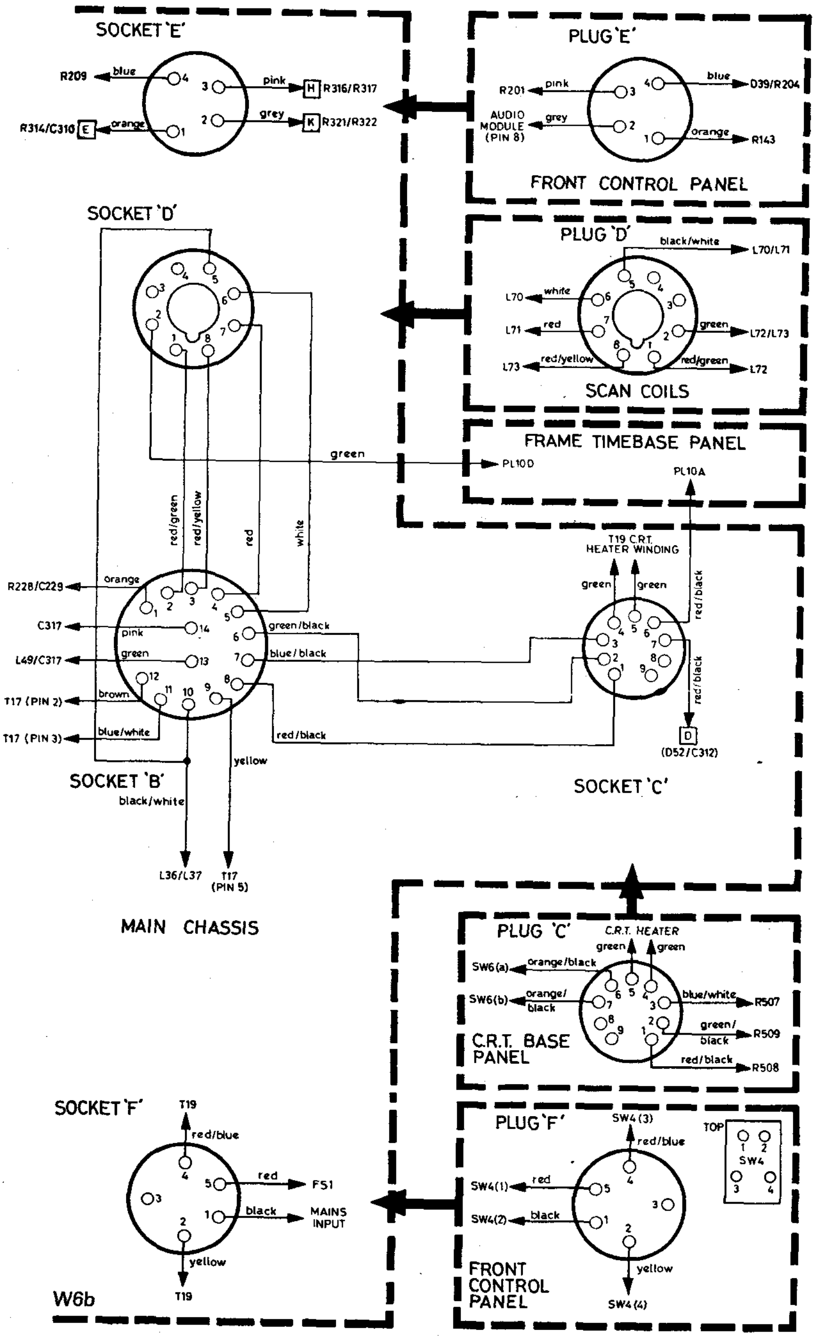
15. Adjust 405 blue amplitude control to straighten any drooping of the horizontal blue lines, thus causing them to be parallel to, or converged with the yellow lines. If, however, the blue and yellow horizontal lines cross over each other, they should be made parallel, or converged by adjusting 405 blue tilt control. It may not be possible to converge the blue and yellow horizontal lines along their entire length until step 16 has been carried out.

16. If there is any undulation of the blue horizontal lines after carrying out



W6a

(W6a) Plug and Socket Interconnections (Pye CT70 and CT71) (Part)



(W6b) PLUG AND SOCKET INTERCONNECTIONS (PYE CT70 AND CT71) (CONTINUED)

step 15 these should be straightened out by adjusting 405 blue parabola control. Alternate steps 15 and 16 until the yellow and blue lines are converged.

17. Adjust 405 blue lateral control to converge the vertical blue and yellow lines at the left and right sides of the screen.

18. For optimum results repeat steps 14–15, thus producing an overall white crosshatch. The dynamic convergence is now complete.

Setting up the Blue Dynamic Lateral Coils: When the convergence and scan coils have been disturbed (or replaced) it may be found that the blue lateral correction is poor, and the following steps should then be taken:

1. Switch to 625, disconnect black and grey leads from blue lateral shift magnet (L57) and check sides of screen for equal spacing of blue verticals from yellow verticals. If the spacing is assymmetrical, rotate the convergence coil assembly (with respect to the scan coils) until the spacing is symmetrical about the centre white vertical.

2. Rotate the 625 blue lateral coil (L52–53) fully clockwise and then unscrew $2\frac{1}{2}$ turns (at this point minimum current will flow in the lateral magnet).

3a. If blue verticals are outside yellow verticals (wide blue field) the connections to the lateral magnet should be: black lead to left-hand tag; grey lead to right-hand tag (viewed from rear of set).

3b. If blue verticals are inside yellow verticals (narrow blue field) the connections to the lateral magnet should be: black lead to right-hand tag; grey lead to left-hand tag (viewed from rear of set).

4. Rotate blue lateral coil (L52–53) in an anticlockwise direction to converge blue verticals with yellow verticals.

5. Switch to 405, rotate 405 blue lateral coil (L54–55) fully clockwise, then unscrew until correct lateral convergence is obtained.

Grey Scale Tracking, Luminance and Colour Drive Adjustments: The following adjustments should be carried out, or checked, whenever it becomes necessary to replace the picture tube and/or either of the two panels, or to renew valves, transistors and associated components. It is essential to ensure, firstly, that the purity adjustments are correct.

(a) Grey Scale:

1. Set contrast (RV4) and colour (RV11) controls to minimum.

2. With brightness (RV14) at maximum, adjust pre-set brightness (RV15 at rear of front control panel) to obtain a reading of 220 V at SW6(d) (green/white lead on C.R.T. base panel), using an Avo 8 or similar set to the appropriate range.

3. Turn the screen drive (RV40–41–42) controls on convergence panel fully anticlockwise.

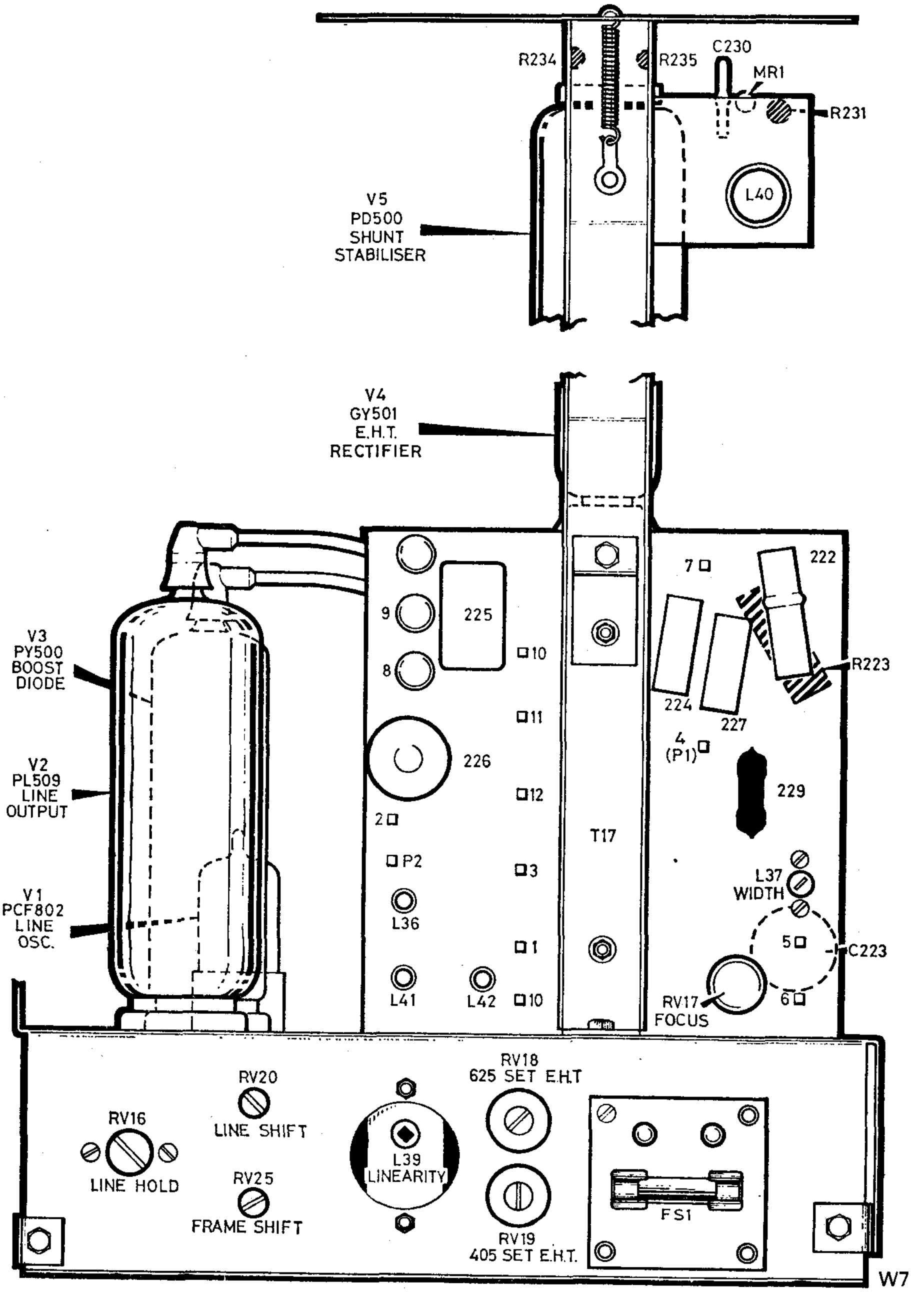
4. With background switch (SW6) on C.R.T. base panel in "set up" position adjust red screen (RV42) until a red line is just perceptible.

5. Similarly, adjust blue (RV40) and green (RV41) screens, ensuring that all three lines are only just visible and of equal strength.

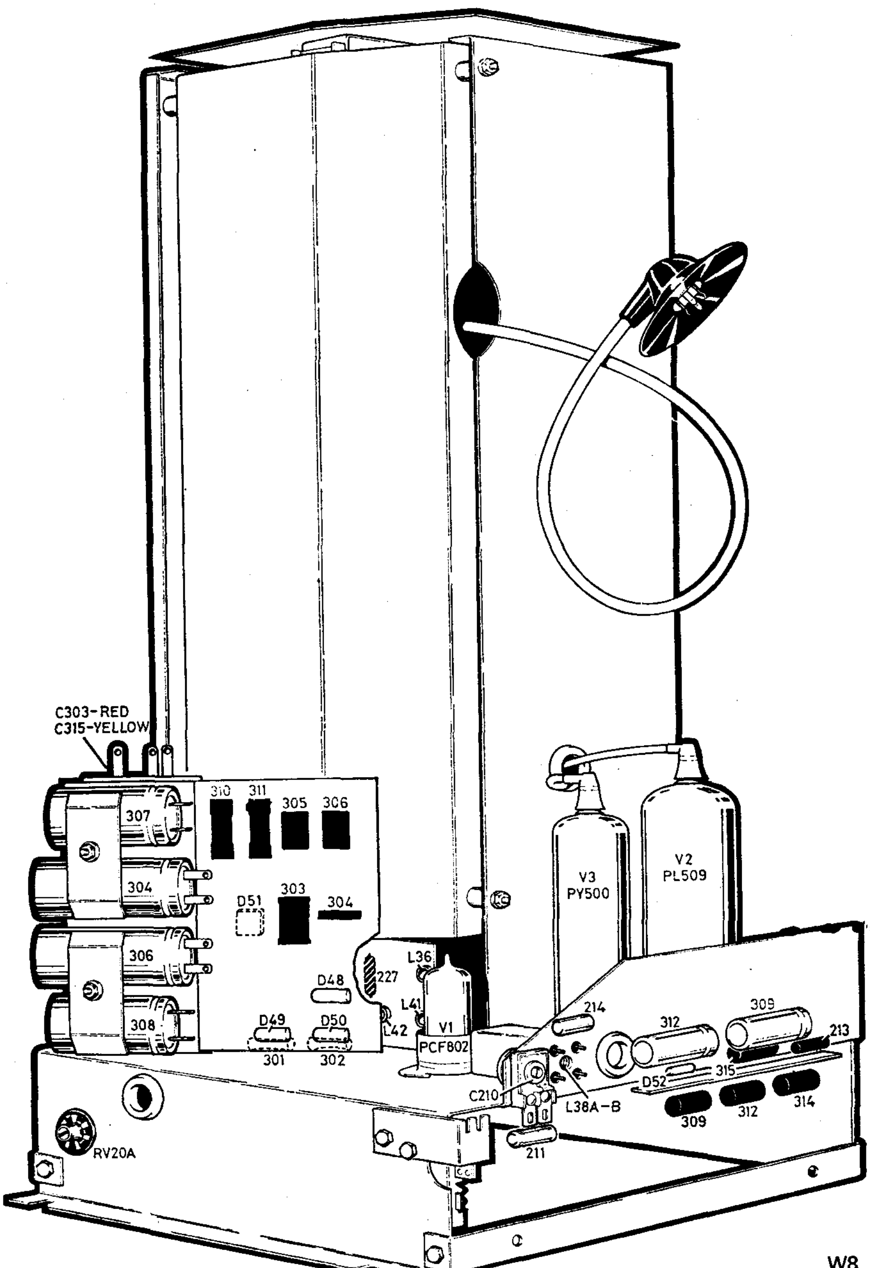
6. Return background switch to "normal".

7. Repeat (2), but this time to obtain a reading of 210V.

(b) White Tone: These adjustments are best carried out using a test card transmission, in the centre of which is a five step contrast wedge. Observe the



(W7) Component Layout—Line Timebase (Pye CT70 and CT71)



(W8) Component Location—Line Timebase (Pye CT70 and CT71)

top white square and adjust the luminance drives to the green and blue guns (RV44–45) to obtain a good neutral white (illuminant "C"). A further slight adjustment may be necessary to the grey scale tracking in order to improve the colour neutrality in the dark grey region and this should be followed by a final adjustment of the luminance drives.

Note: For correct setting of contrast and brightness, turn contrast to minimum and adjust brightness until screen is just black; advance contrast until the blacks just start to "sit up" and then slightly reduce contrast.

(c) Colour Difference Drives: The colour drive adjustments should be carried out whilst observing a standard colour bar signal displayed on the picture tube, having first ensured that grey scale and luminance is correct. The coloured bars from left to right on the screen in order of luminance are—white, yellow, cyan, green, magenta, red and blue, the extreme right being black.

The white bar consists of luminance drive only and will, of course, not be affected by colour difference drive adjustments; thus it is used as a reference when adjusting the drive controls. The coloured bars consist of certain proportions of luminance and colour difference drive signals, however, so the intensity of these bars will be affected if the drive controls are adjusted.

Only one gun should be operating at any particular time, so you will observe on the screen those bars of which that colour is a component part. For instance, with only the red gun operative, the white, yellow, magenta and red bars should all appear equally bright red; the others should be black.

With contrast and brightness controls set for a good monochrome picture:

1. Reduce the contrast control to approximately 80 per cent of its original setting.
2. Switch off the blue and green screens (SW7 and SW8 on convergence panel).
3. Adjust the colour control until all four bright bars are equally bright red, with the remainder approximately black.
4. Switch off the red screen (SW9) and switch on the blue (SW7).
5. Adjust the blue colour difference control (RV27 on C.D.A. panel) until all four bright bars are equally bright blue and the remainder approximately black.
6. Switch off the blue (SW7) and switch on the green (SW8).
7. Similarly, adjust the green colour difference control (RV26 on C.D.A. panel) for four equally bright green bars and the remainder approximately black.

Note: As mentioned earlier, the bar on the extreme left of the screen will not change in intensity and therefore serves as a reference. This method of adjusting the colour drives takes into account the efficiency of the individual phosphors.

In earlier panels the value of R361 was 100k and D53 was type OA81. Panels in current production contain encapsulated transistor types BC147 and BF194 in lieu of BC107 and BF184 respectively.

C.R. Tube Removal:

If it should become necessary to remove the C.R. tube, proceed in the following manner:

1. Disconnect and remove from cabinet the line timebase chassis assembly, also the decoder, C.D.A. and frame timebase panels.

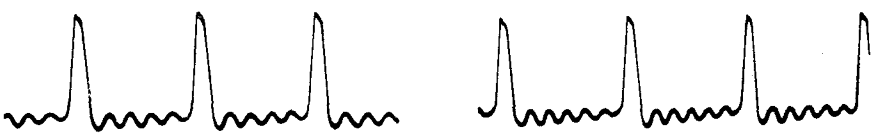
2. Unplug the degaussing coils, then remove C.R.T. base panel, convergence and scan coil assemblies.

3. Slacken off the OBA nut in the top left-hand corner and release the tube harness resistor and capacitor; then unsolder braiding at bottom of cone shield and unhook the spring at each corner. The cone shield can now be lifted off.

4. Lay the cabinet face downward, with supporting padded blocks under each corner, then remove the four OBA corner nuts and plates, also the tube harness.

When refitting the C.R. tube, the above procedure can be carried out in reverse. It is important to ensure that the scan coils, convergence yoke and blue lateral shift assembly are correctly positioned, as shown in the illustration, with the latter close to the yoke but allowing sufficient space for the purity rings to be turned. A "warm-up" period of about 30 minutes should elapse before carrying out purity and static convergence adjustments.

If a replacement C.R. tube has been fitted, it will additionally be necessary to readjust the screen, luminance and colour difference drives, also to check through the dynamic convergence procedure. In the event of a slightly reddish hue being apparent with the luminance drives adjusted to best advantage, the leads connected to P1 and P2 on the C.R.T. base panel should be interchanged to compensate for this condition.



W9

(W9) 3RD HARMONIC WAVEFORMS: *(left)* : 625; *(right)* : 405 (PYE CT70 AND CT71)

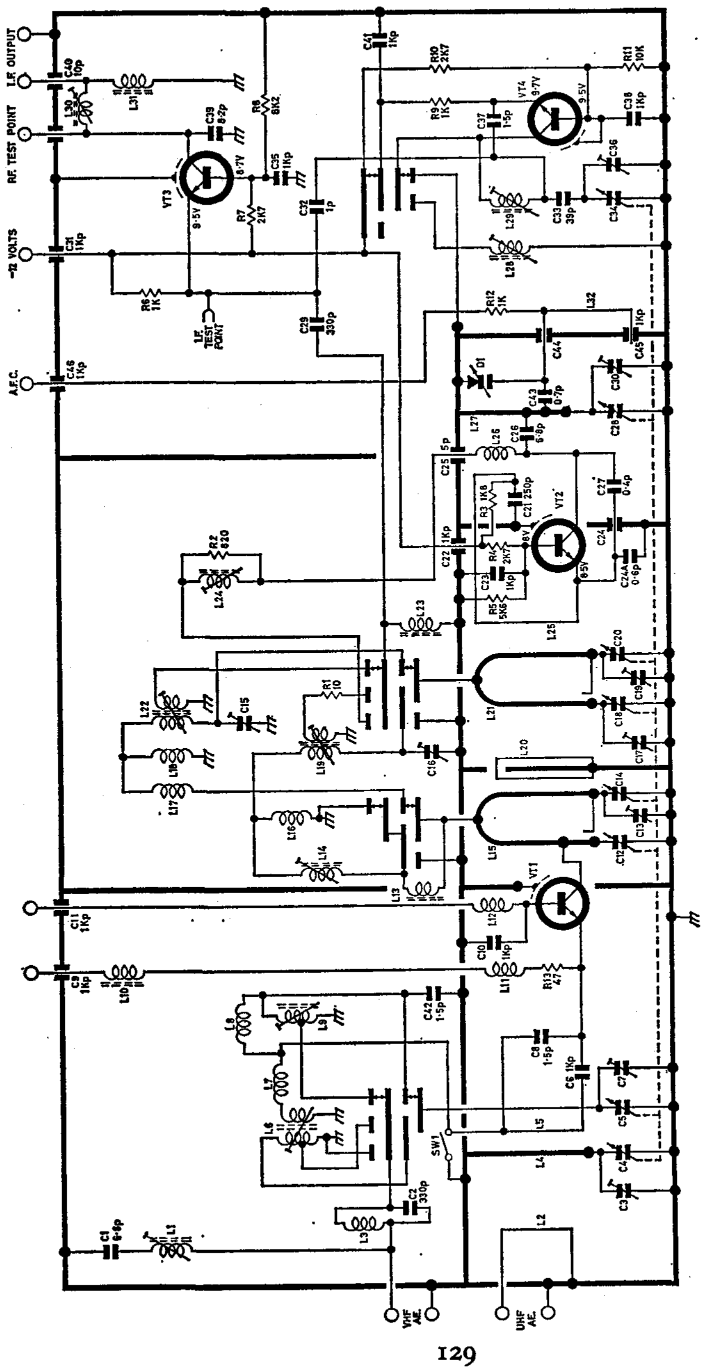
Setting up the Decoder:

In the absence of a colour bar pattern generator it is not possible to satisfactorily perform the complete decoder alignment procedure. Certain recognisable faults can, however, be corrected in a complete receiver when receiving a transmitted colour bar signal, provided that the decoder has not been tampered with since being accurately set up at the factory or alternatively has not suffered any general damage which might give rise to multiple faults. It should be noted that the figures quoted below for burst and chroma apply only to B.B.C. 95 per cent colour bars and those for black-to-white only to colour bars and test cards.

Little or no Output from Decoder: Using an oscilloscope (total capacity not > 50pF), make the following tests on a good signal, i.e. satisfactory monochrome picture.

(*a*) Decoder input (TP20)—sync. level 1V; burst 0·5V p-p; chroma 1V p-p; black-to-white 3V. All to within ±3dB when receiver is accurately tuned.

(*b*) T9 secondary—burst 80mV p-p; chroma 250mV p-p (to within ±3dB).

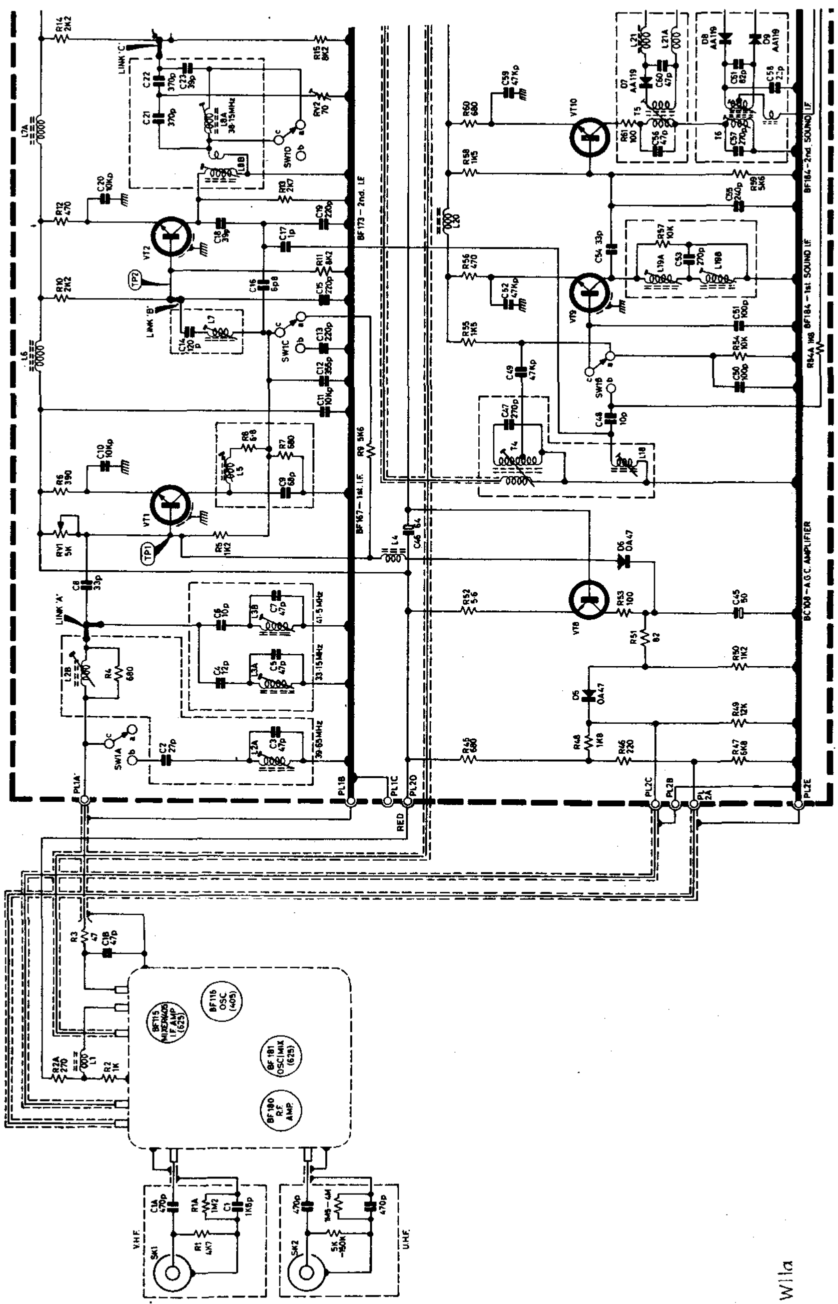


ALL CAPACITORS IN μF UNLESS OTHERWISE STATED
ALL RESISTORS IN OHMS UNLESS OTHERWISE STATED

W10

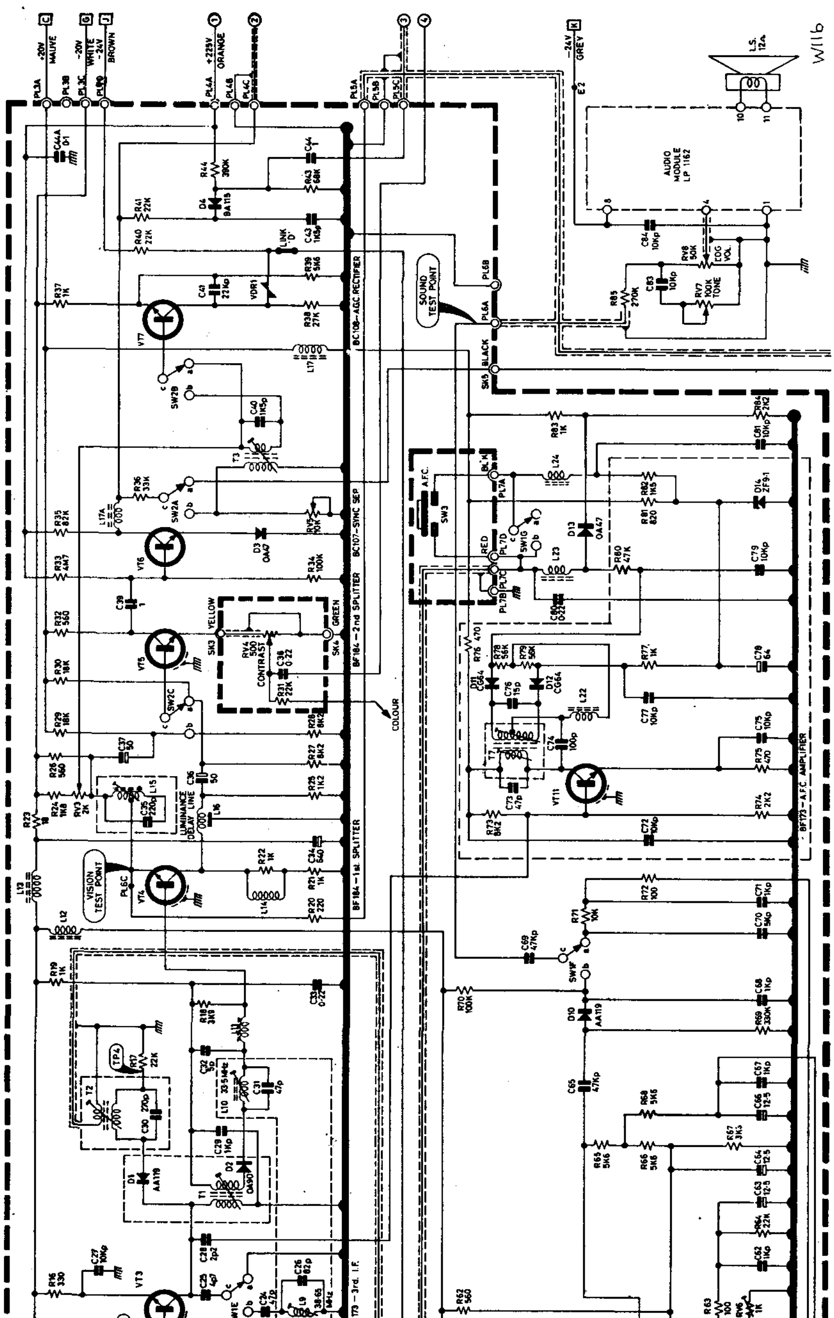
SW1 CLOSED ON UHF ONLY.
BAND SWITCH SHOWN IN BAND III POSITION.
ALL VOLTAGES MEASURED WITH AVO 8 25V RANGE.
VT3 & VT4 VOLTAGES MEASURED WITH SWITCH TO BAND I.
VT2 VOLTAGES MEASURED WITH SWITCH TO UHF.

(W10) Circuit Diagram—Multiband Tuner (Pye CT70 and CT71)

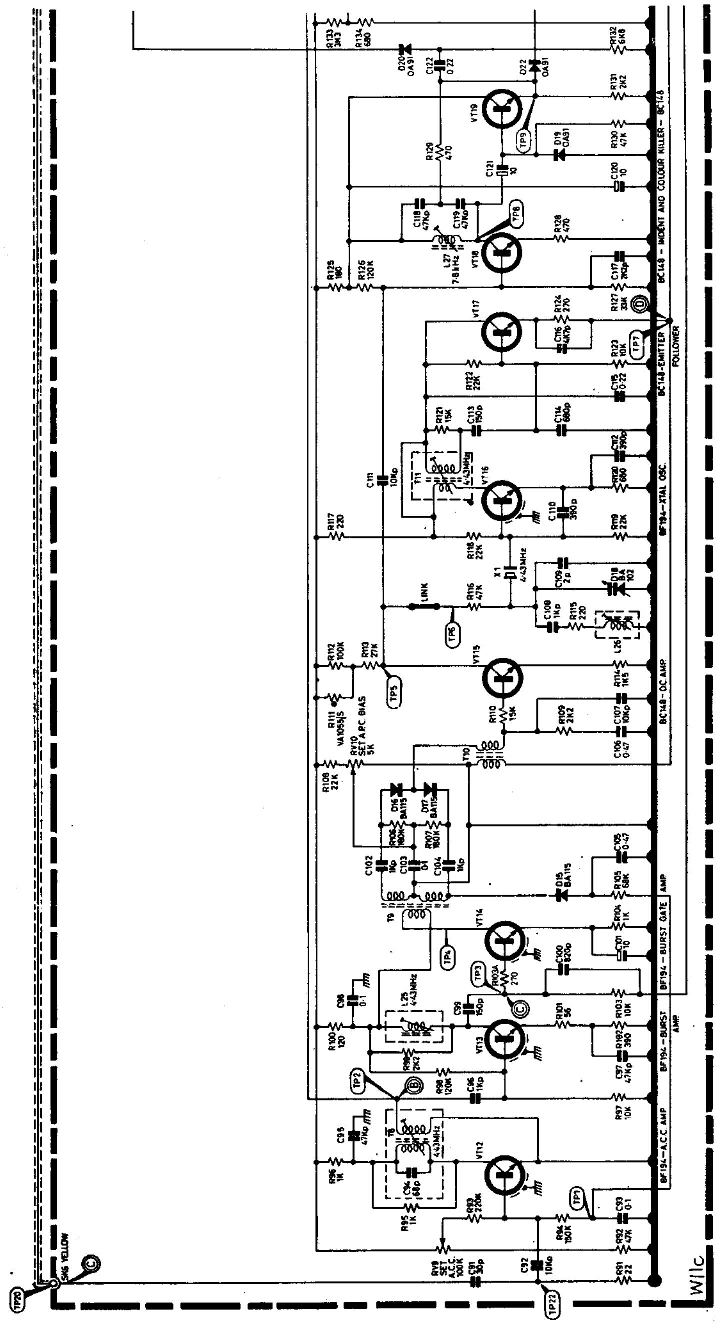


(W11a) Circuit Diagram—Vision and Sound I.F. Stages, Video, A.F., Sync. Sep., A.G.C., A.F.C., and Decoder. The Right-hand Side is Continued on (W11b) and the Bottom on (W11c) (Pye CT70 and CT71)

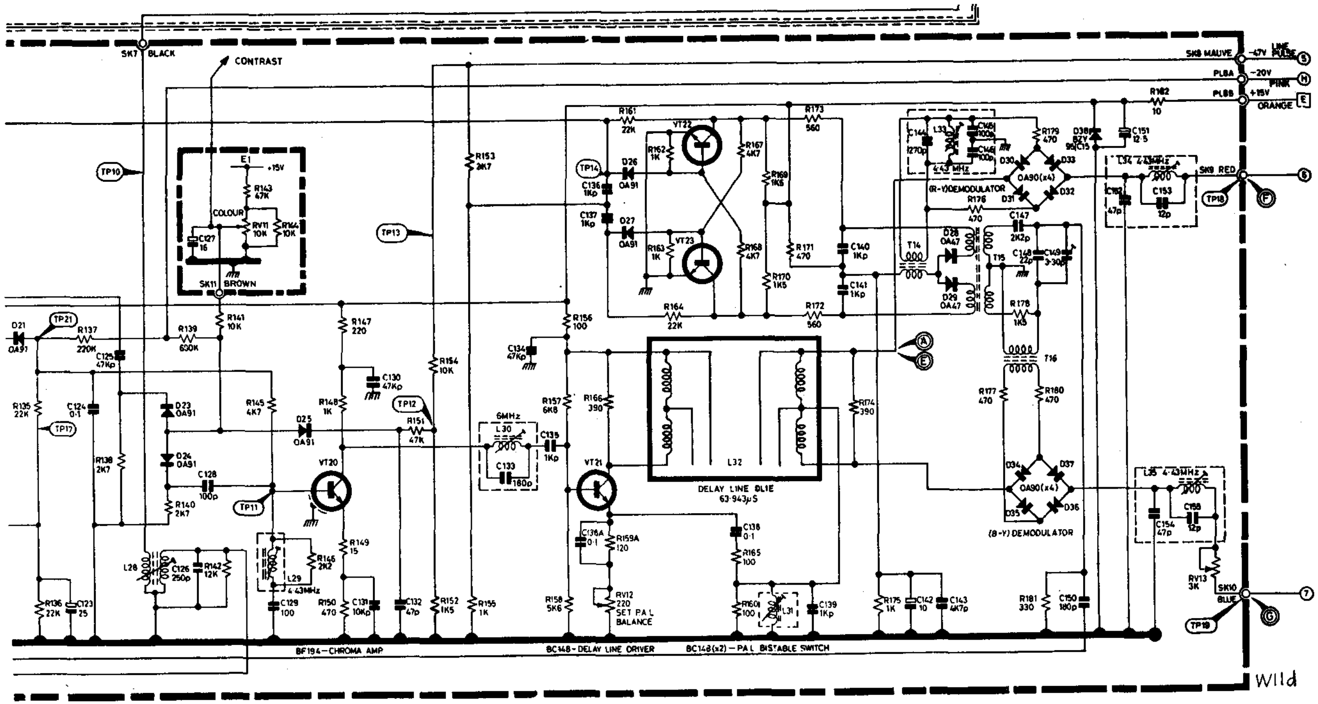
W11a



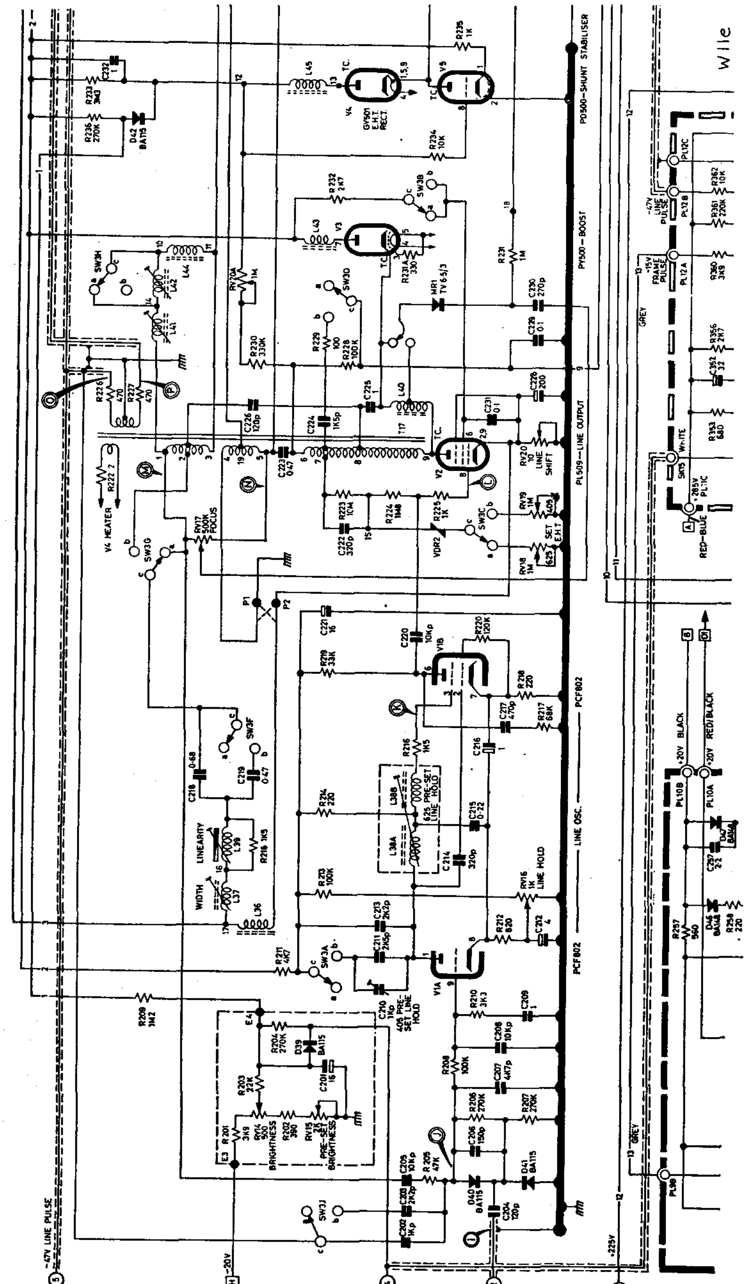
(W11b) Circuit Diagram—Left-hand Side is Continued on (W11a) and the Bottom on (W11d) (Pye CT70 and CT71)



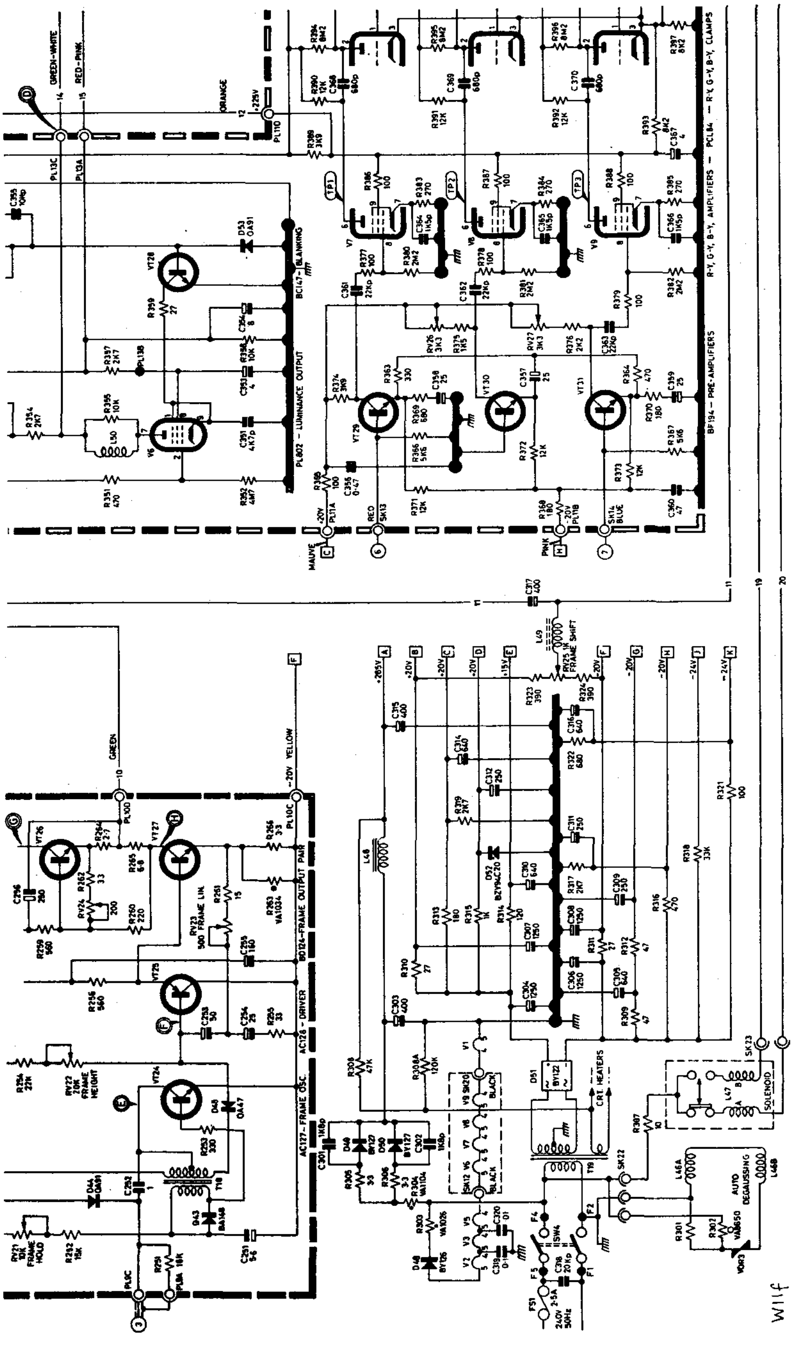
(W11c) Circuit Diagram—Top is Continued on (W11a) and Right-hand Side on (W11d) (Pye CT70 and CT71)



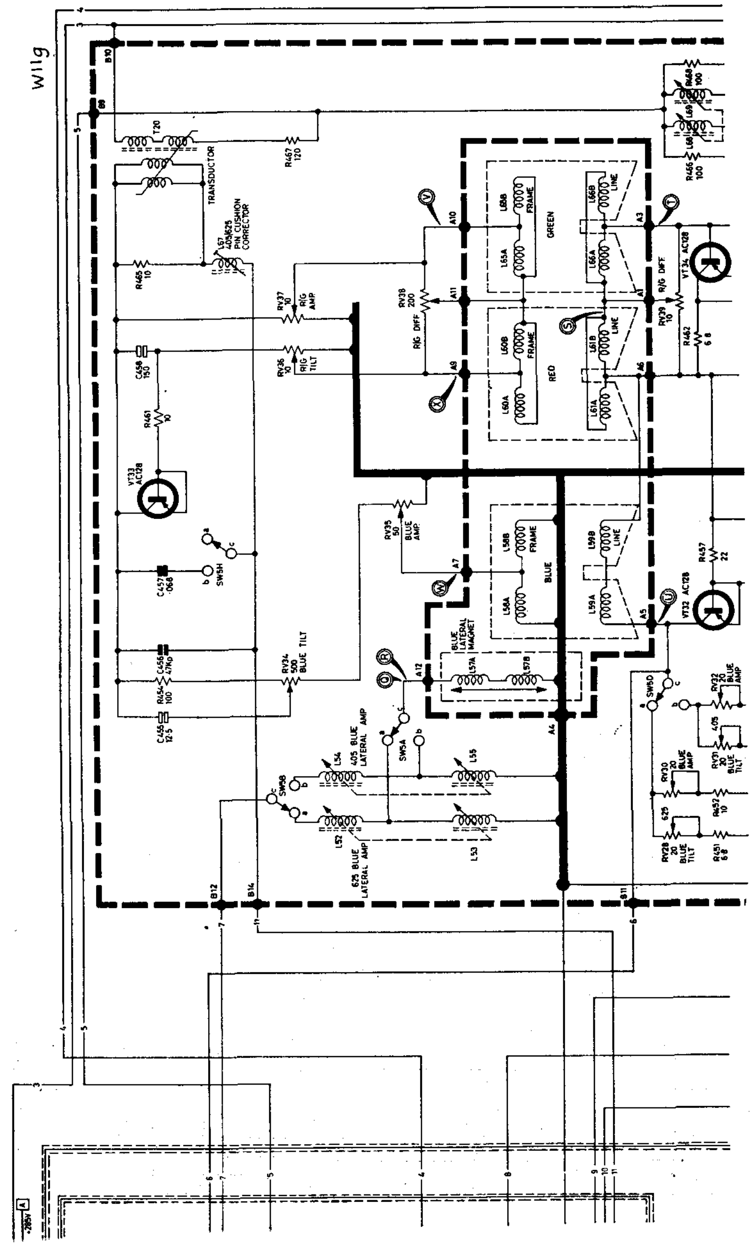
(W11d) CIRCUIT DIAGRAM—TOP IS CONTINUED ON (W11b) AND LEFT-HAND SIDE ON (W11c) (PYE CT70 AND CT71)



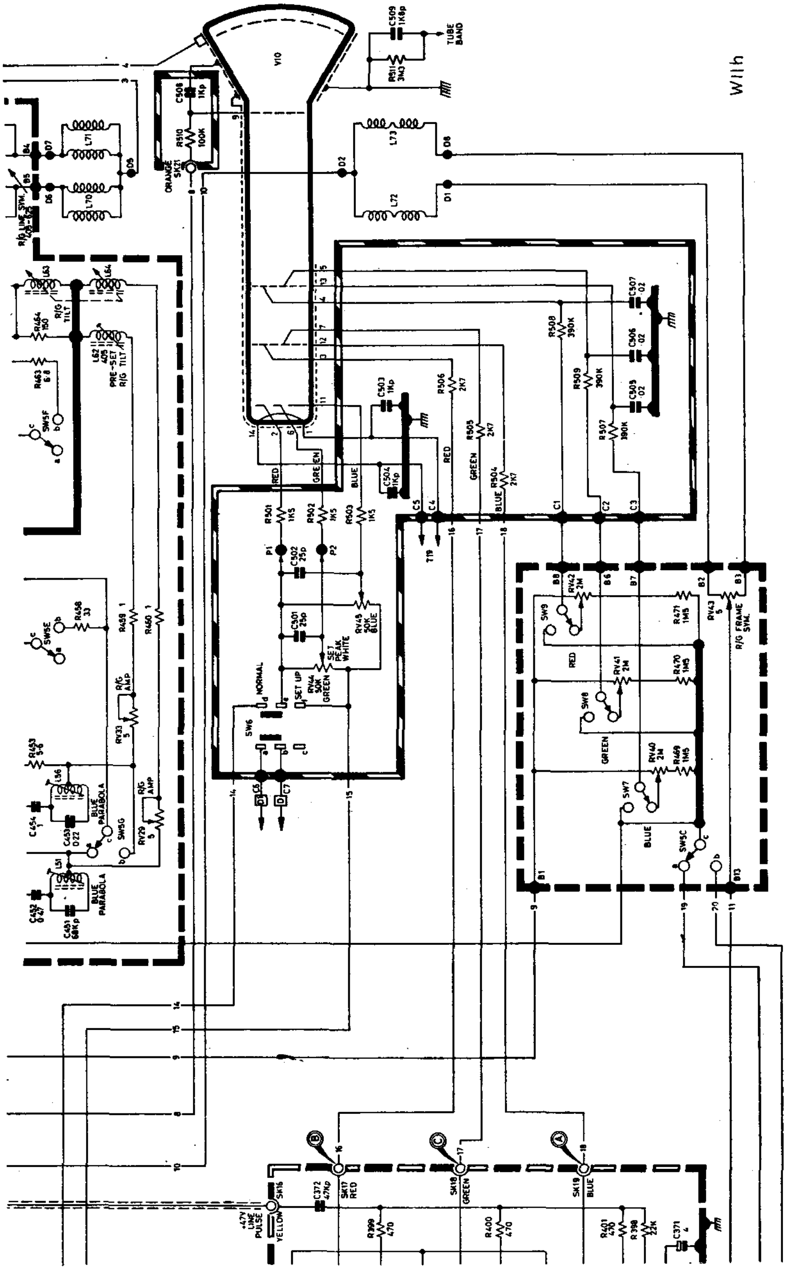
(W11e) Circuit Diagram—Line and Frame Timebase, Power Supply Line Output, Luminance and Colour Difference Stages, Tube and Convergence (Part). The Right-hand Side is Continued on (W11g), the Bottom on (W11f) (Pye CT70 and CT71)



(W11f) Circuit Diagram—Right-hand Side is Continued on (W11h), Top is Continued on (W11e) (Pye CT70 and CT71)



(W11g) Circuit Diagram—Left-hand Side is Continued on (W11e), Bottom is Continued on (W11h) (Pye CT70 and CT71)



(W11h) Circuit Diagram—Left-hand Side is Continued on (W11f), Top is Continued on (W11g) (Pye CT70 and CT71)

(*c*) Chroma delay line terminals (input and output)—burst 0·4 V p-p approximately; chroma 1 V approximately (with colour control RV11 at maximum).

(*d*) T10/R124 (TP7)—reference signal 5 V p-p approximately.

(*e*) Decoder outputs (TP18, TP19)—maximum signal output at (R–Y) between 0·6 and 1 V p-p; at (B–Y) two thirds the output obtained at (R/Y). The ratio (B–Y) to (R–Y) should be adjusted as necessary by means of RV13.

Reference Oscillator Not Locked In: Colour stripes or "rainbows" all over picture. Assuming that all the checks listed in the preceding paragraph prove satisfactory, the following procedure should lock in the oscillator.

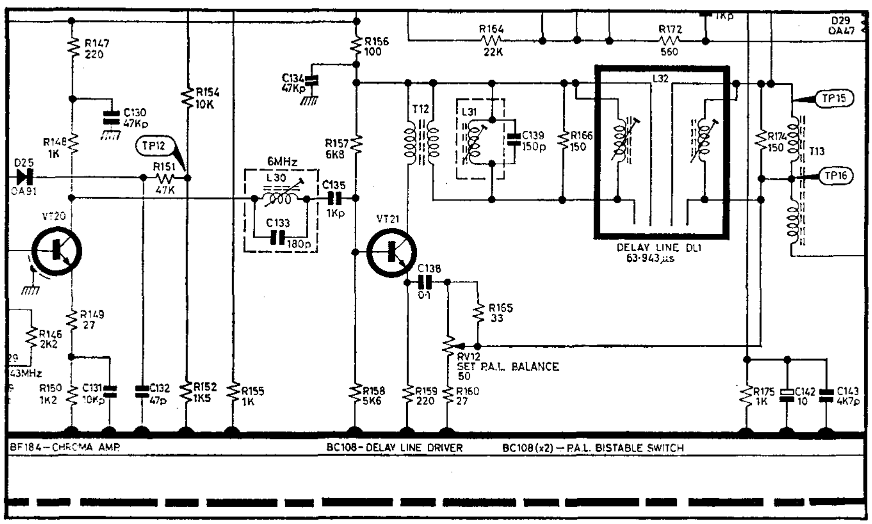
(*a*) Adjust set A.P.C. bias (RV10) slowly until oscillator locks in (as seen on picture). Continue adjusting slowly until oscillator always pulls in quickly after momentarily shorting (or disconnecting) input to decoder.

Note: A slow pull-in indicates that the oscillator is near the edge of its pull-in range.

(*b*) Using Avo 8 on 25 V range, check that VT15 collector is between 4 and 6 V D.C. Adjust L26 if necessary to bring it within this range.

Colours Present But Very Incorrect on Some or all Pictures: This may indicate that the gating is at fault. Connect an oscilloscope with probe (< 10 pF) to base of VT14; burst should be seen at peak of gating pulse train and the latter should rise to at least +1·5 V (i.e. well above positive pulse of signal voltages). The pulse position may be shifted by means of L28.

If no gating pulse is present, check back to the gating pulse input from I.F. (TP10), where a larger gating pulse should be evident.



W12

(W12) Circuit Diagram—Decoder with DL1 Delay Line (Pye CT70 and CT71)

Similar Symptoms but Blue Bar Correct: This may be due to failure of the P.A.L. switch. Check that waveforms exist at VT19 emitter and D20 cathode. If not, check blanking pulse input from line timebase at SK8.

P.A.L. Balance Test: This test can be made provided that the reference oscillator is correctly locked into the B.B.C. It will be found earlier under "Delay Line Circuit" but is repeated here for convenience.

(*a*) Temporarily connect a 100k resistor from R124 to VT20 base (TP7 to TP11). Turn colour control (RV11) to minimum.

(*b*) Adjust set P.A.L. balance (RV12) and fine delay (L31) in turn to obtain minimum volts at the junction D30/D31 (TP15).

Note: By setting the P.A.L. balance as above "hanover bars" can be eliminated, but phase errors may remain and give rise to saturation errors.

Line Adjustments:

In the event of the line output transformer or any of its associated components being replaced it will be necessary to carry out certain adjustments, for which a synchronized raster is required on both systems. The two-set E.H.T. controls (RV18 and RV19) should first be turned fully clockwise.

Line Oscillator:

1. Turn the line hold (RV16) to a mid-position.
2. Adjust the core of the oscillator coil (L38A–B) to lock the raster on 625 lines.
3. Adjust the trimmer capacitor (C210) to lock the raster on 405 lines.

Set E.H.T.:

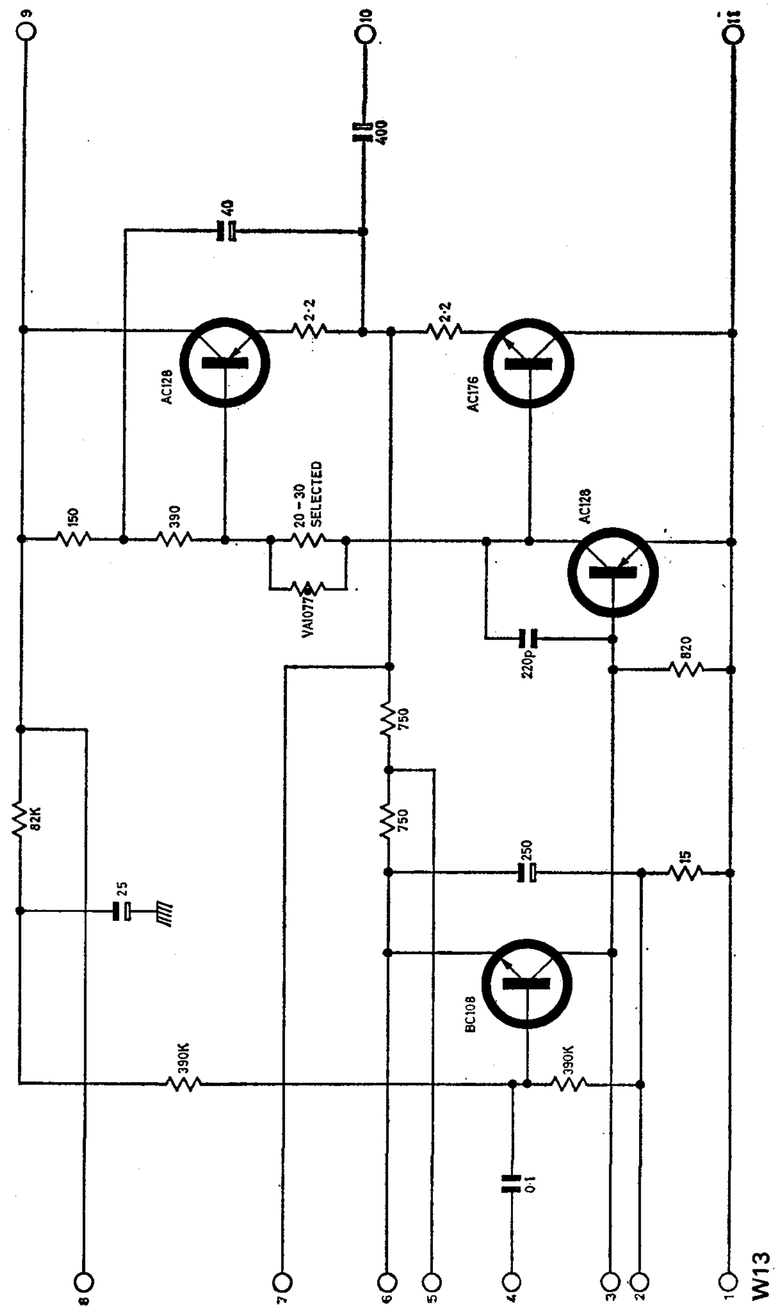
1. Switch to 625 lines and connect E.H.T. voltmeter (Electrostatic or Avo 8 and 25 kV multiplier—20,000 per volt moving coil meter) to C.R.T. anode cap. With fairly low picture brightness, adjust set E.H.T. (RV18) for 25 kV.
2. Adjust the linearity (L39) and width (L47) controls as required, then re-check E.H.T. voltage.
3. Switch to 405 lines and repeat (1) and (2), this time adjusting RV19.

Shunt Stabiliser Current:

1. Turn brightness control fully anticlockwise.
2. Connect Avo 8 or similar across R235 (located on base of V5).
3. A reading of 0·75 V (19 in.) or 1·1 V (25 in.) should be obtained, which corresponds to 0·75 mA or 1·1 mA beam current respectively.
4. Adjust the potentiometer (RV20A) as necessary to obtain this reading.
5. For optimum results alternate this adjustment with the preceding one (set E.H.T.).

Note: In earlier models where RV20A is omitted, the value of the fixed resistor R230 should be changed slightly by selecting a preferred value close to the original 560k.

Third Harmonic Tuning: The 625 (L41) and 405 (L42) third harmonic tuning coils are adjusted during transformer test and will not normally require



(W13) Circuit Diagram—Audio Module (Pye CT70 and CT71)

attention when replacing the line output transformer assembly. In the event of maladjustment, however, proceed as follows:

1. Turn both set E.H.T. controls to minimum, i.e. fully clockwise.

2. Move rear cover panel slightly to one side and insert probe between injection choke leads immediately above C225 (1 μF).

3. Switch on receiver, select 625 and adjust core of L41 to obtain the waveform shape as illustrated.

4. Repeat on 405, adjusting core of L42.

5. Carry out E.H.T. and beam current adjustments described in the previous section.

Line Transformer Replacement:

1. Disconnect timebase chassis and withdraw from cabinet.

2. Slacken off securing screw and swing rear cover aside.

3. Remove two hexagonal-headed fixing screws in top plate, release both retaining springs and uncleat cableform.

4. Lift off valveholder/bridge bracket and shunt stabiliser (PD500).

5. Disconnect C.R.T. anode connector, uncoil lead and feed through gap between front and side plates.

6. Disconnect all leads which are routed to chassis underside via grommet adjacent to line output valve (PL509).

7. Remove single hexagonal-headed screw securing L.O.P.T. assembly to chassis at rear (facing) side and, if necessary, slacken off corresponding screw at front.

8. The complete assembly can now be drawn away from chassis, thus enabling the three screened leads at the front to be unsoldered.

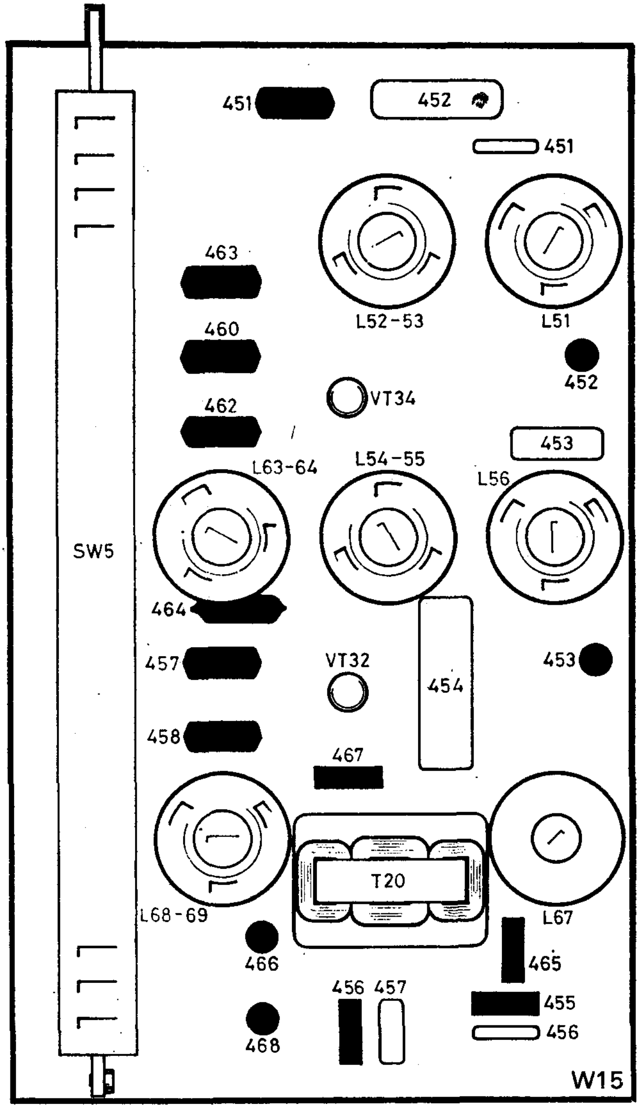
9. Slacken off screws securing shroud assembly and remove E.H.T. rectifier (GY501).

Note: When reassembling the above procedure can be carried out in reverse. It may be found advantageous to replace the front retaining spring before refitting the valveholder/bridge bracket.

Important: During the course of production the positions of pins 10, 11 and 12 have been interchanged. When fitting a replacement L.O.P.T. assembly the leads must be connected to the new transformer panel as shown in the table at the right:

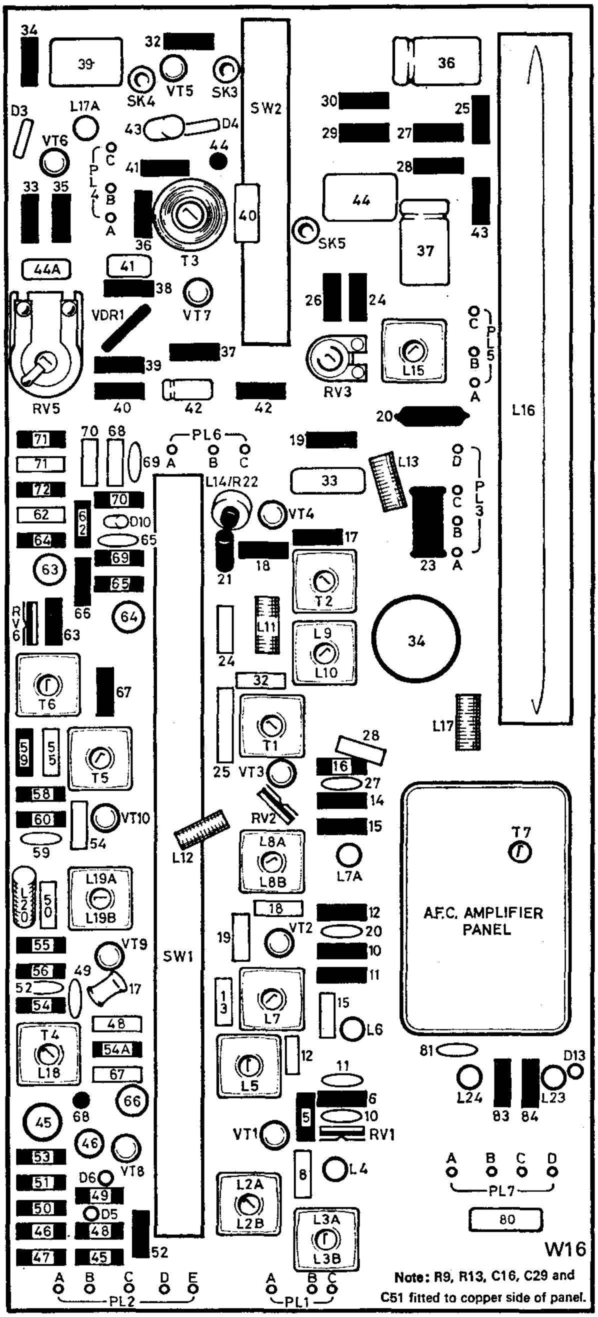
Pin no.	*Colour of lead*
1	black
2	brown
P2	red
3	blue/white
4	yellow/black
5	yellow
6	blue
10	grey
12	grey/white
14	pink
15	black
16	brown
17	black/white
18	white

Note: In some models, two brown leads may be connected to pin 2, and pin 15 may be white or mauve.



(W15) Component Layout—Convergence Panel. Note that R455 and R456 are not Fitted to Later Models (Pye CT70 and CT71)

Line Output Transformer Assembly: A "common" line output transformer assembly (part number AG06928) is supplied for all 19-in. and 25-in. models. It does not include the E.H.T. rectifier and shunt stabiliser valves, or the valve holder/bridge bracket assembly and these items must therefore be removed and retained before returning the faulty assembly. The two alternative values for C226 are included with each replacement assembly and it is important



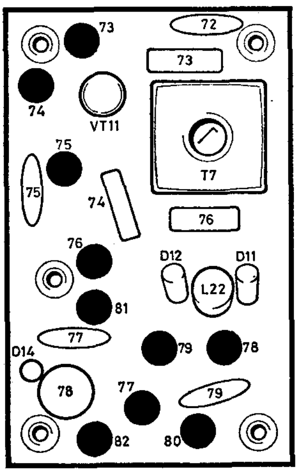
(W16) Component Layout—I.F. Panel (Pye CT70 and CT71)

to ensure that the correct one is used—19-in. models (150pF), 25-in. models (120pF).

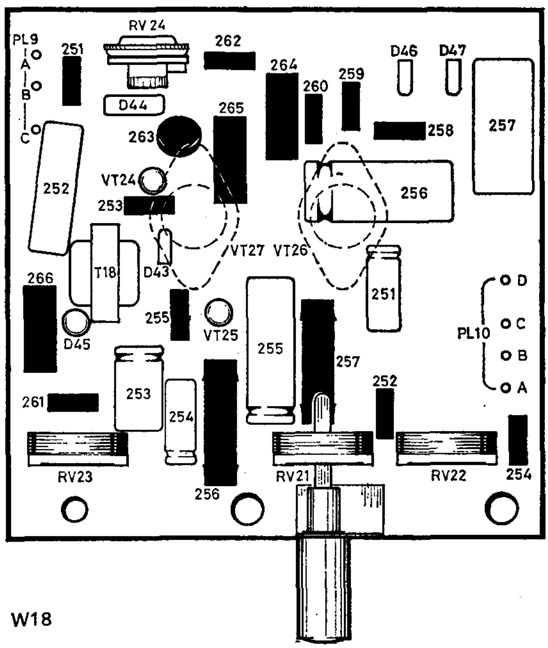
Production Changes: Panels coded BB, BC or BD are virtually identical in appearance, and all are fitted with the type DL1 chroma delay line as shown in the circuit extract. They contain the following electrical variations: C117 was 680pF, and D19–27 inclusive were type OA81.

Panels coded BG onwards use the type DL1E chroma delay line, as shown in the main circuit. With this circuitry the transformers T12 and T13 are deleted, and a number of other components changed in value and/or circuit position. Coincident with the introduction of delay line DL1E, all transistors are changed to encapsulated types BC148 and BF194. Since the BG panel was introduced the following changes apply:

1. C129 was 1000pF.
2. R103A has been added.
3. R104 was 330 ohms.
4. D30–D37 inclusive were type OA70.
5. R129 was 680 ohms.



W17

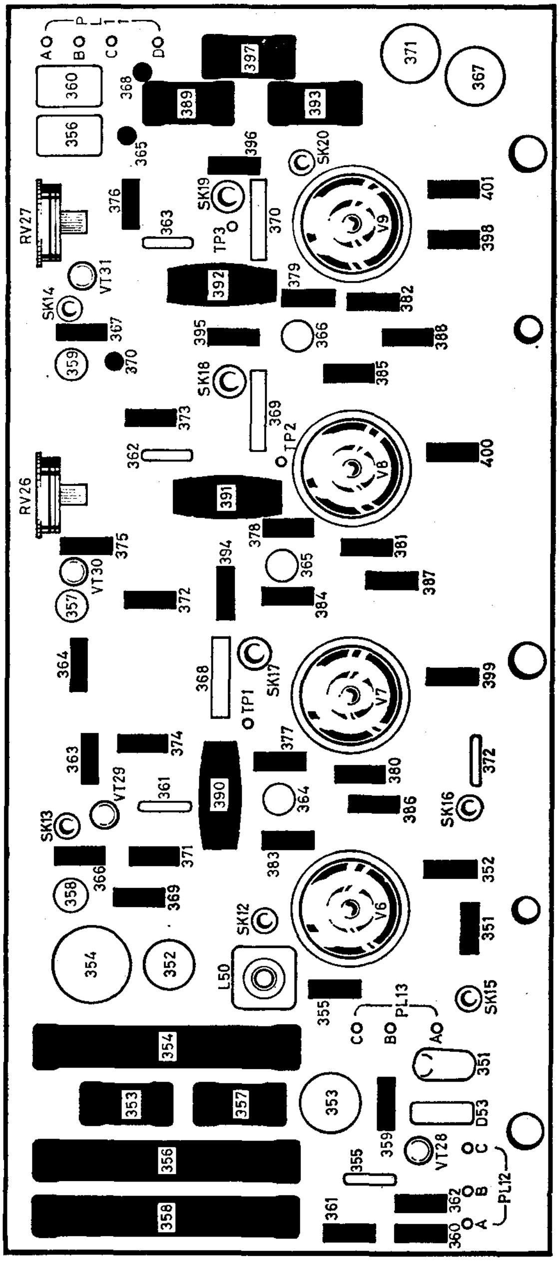


W18

COMPONENT LAYOUTS—
(Left): (W17) A.F.C. AMPLIFIER;
(Right): (W18) FRAME TIMEBASE
(PYE CT70 AND CT71)

Design Improvements: A number of design improvements have been introduced during the course of production, and these are listed below in approximate chronological order:

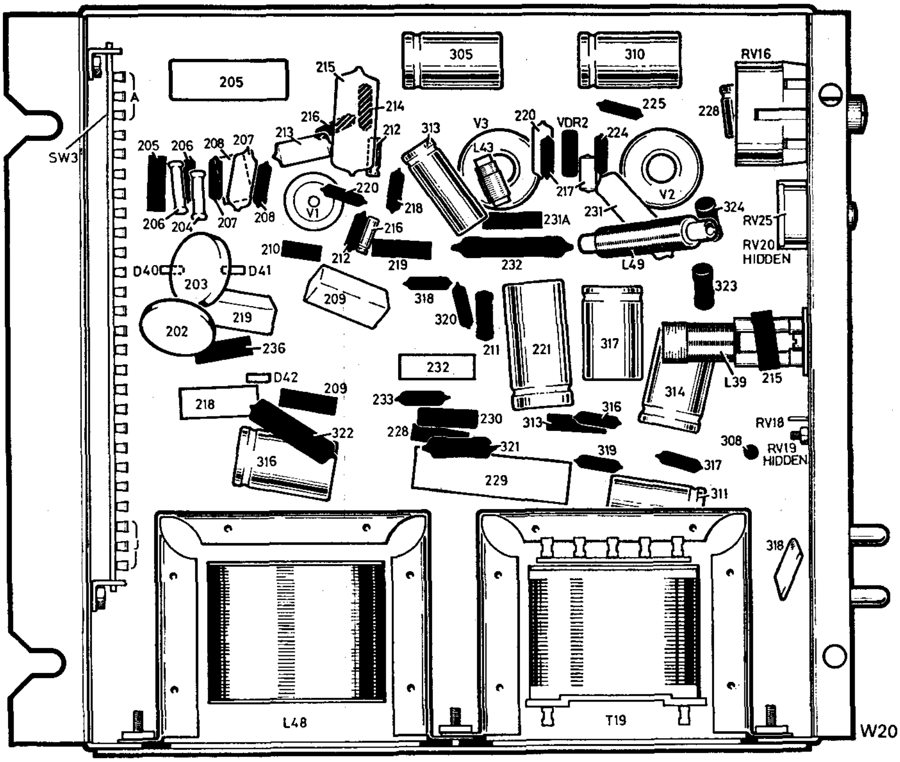
W19



NOTE:- IN LATER RECEIVERS R353,354,356-358,389,393 & 397 ARE MOUNTED VERTICALLY

(W19) Component Layout—Luminance and Colour Difference Amplifier (Pye CT70 and CT71)

F



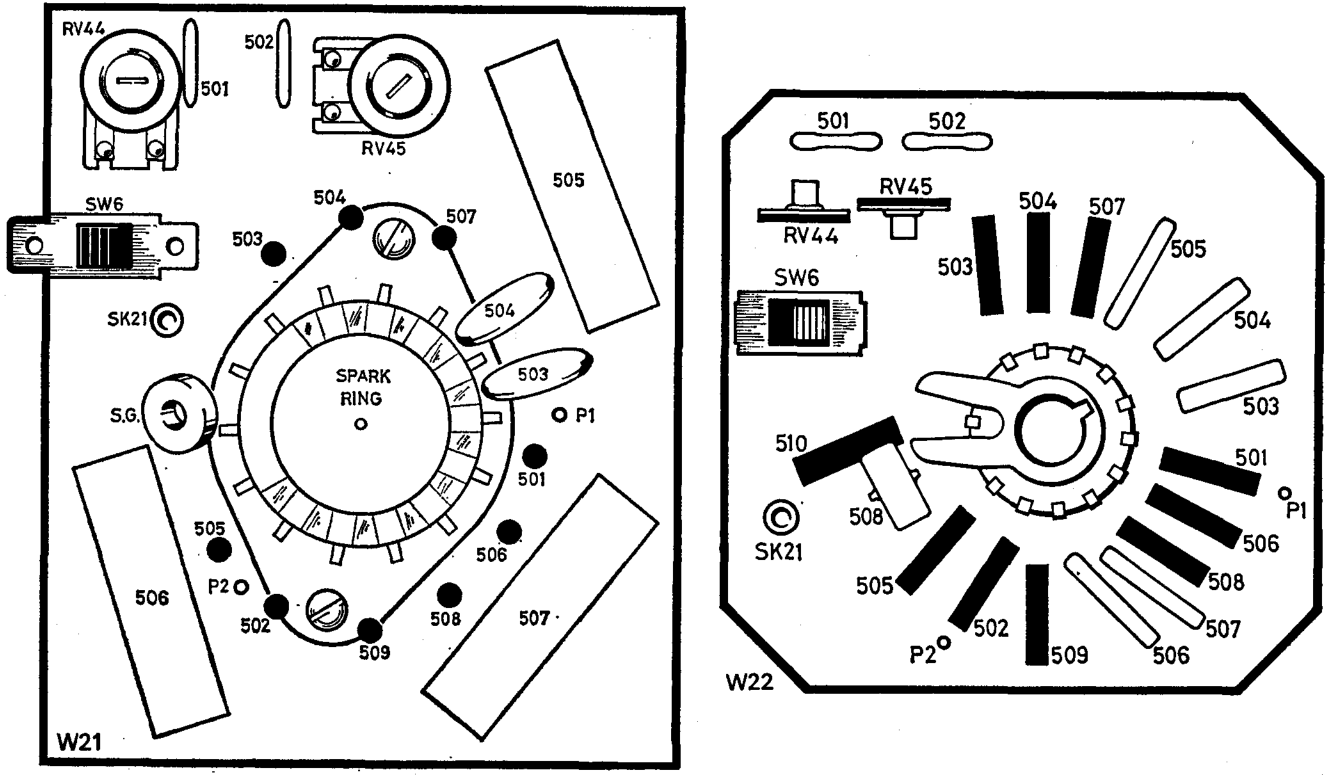
(W20) Component Layout—Line Timebase and Power Supply (Pye CT70 and CT71)

Power Supplies: 1. C318 added. 2. R308A added. 3. V2 and V3 reversed in heater chain. 4. C319 and C320 added. 5. R310 and R311 were 18 ohms or 33 ohms. 6. R318 was 1k. 7. R320 and C313 were deleted.

Line Timebase: 1. C224 was 2200 pF and 4700 pF in series. 2. C219 was 0·68 μF. 3. C225 was 2·2 μF. 4. C226 was 150pF in 25-in. models. 5. R217 was 68k. 6. C217 was 390pF. 7. R223 was 8·2M. 8. C209 was 0·47 μF. 9. R210 was 8·2k. 10. C211 was 2200pF. 11. C216 was 4 μF. 12. R231A was added. 13. L40 was untapped. 14. R230 was 560k. 15. RV20A added, was 330k in early models. 16. C202 was 170 pF. 17. C203 was 2200 pF. 18. SW3J(c) was connected to T17 (tap 1). 19. C232 was 0·47 μF.

Note: R462 and R463 were 4·7 ohms and 3·9 ohms respectively. R465 was 390 ohms or 680 ohms. C457 was 0·1 μF polyester. R455 (3·3k) was fitted in parallel with C456. R456 (1·8k) was fitted in parallel with C457. R467 was 470 ohms.

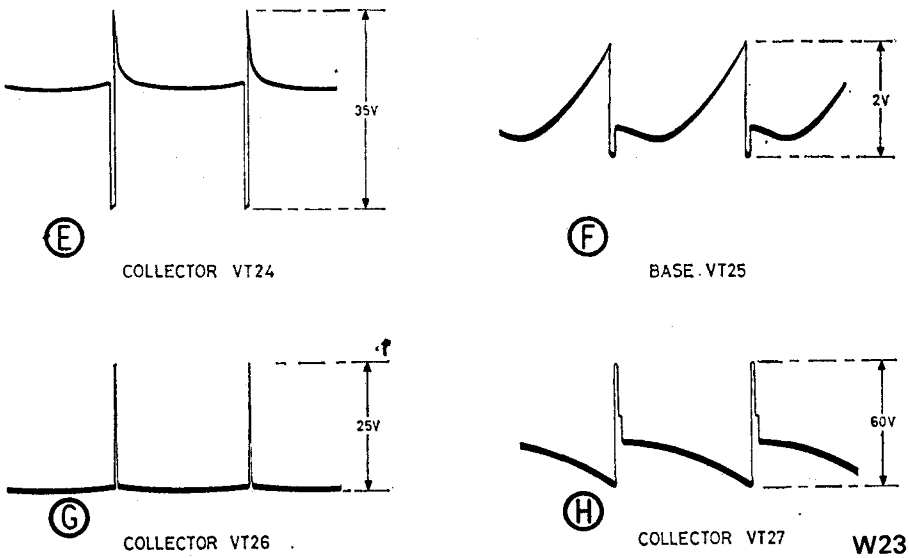
C.R.T. Base Panel: The two versions of C.R.T. base panel illustrated are the "interim" employing a commutator type spark gap ring, and that currently fitted in production where the spark gap for each electrode is incorporated in the panel board print. The early panels (certain of which contain individual



Component Layouts—*(Left)* : (W21) C.R.T. Base Panel; *(Right)* : (W22) C.R.T. Base (Alternative) (Pye CT70 and CT71)

spark gap discs) have been disregarded, since all receivers to which these were fitted are accounted for by the supply of a replacement as part of the anti-corona kit number AE02140. In any instance where a receiver is found to contain a C.R.T. base panel other than those illustrated, however, application for a anti-corona kit should be made to Pye Group Technical Liaison Department, Cambridge.

Note: In some "interim" panels, R501–R506 inclusive are 560 ohms, and R510 and C508 are not fitted. Also note that the set peak white pots. are not interchangeable.

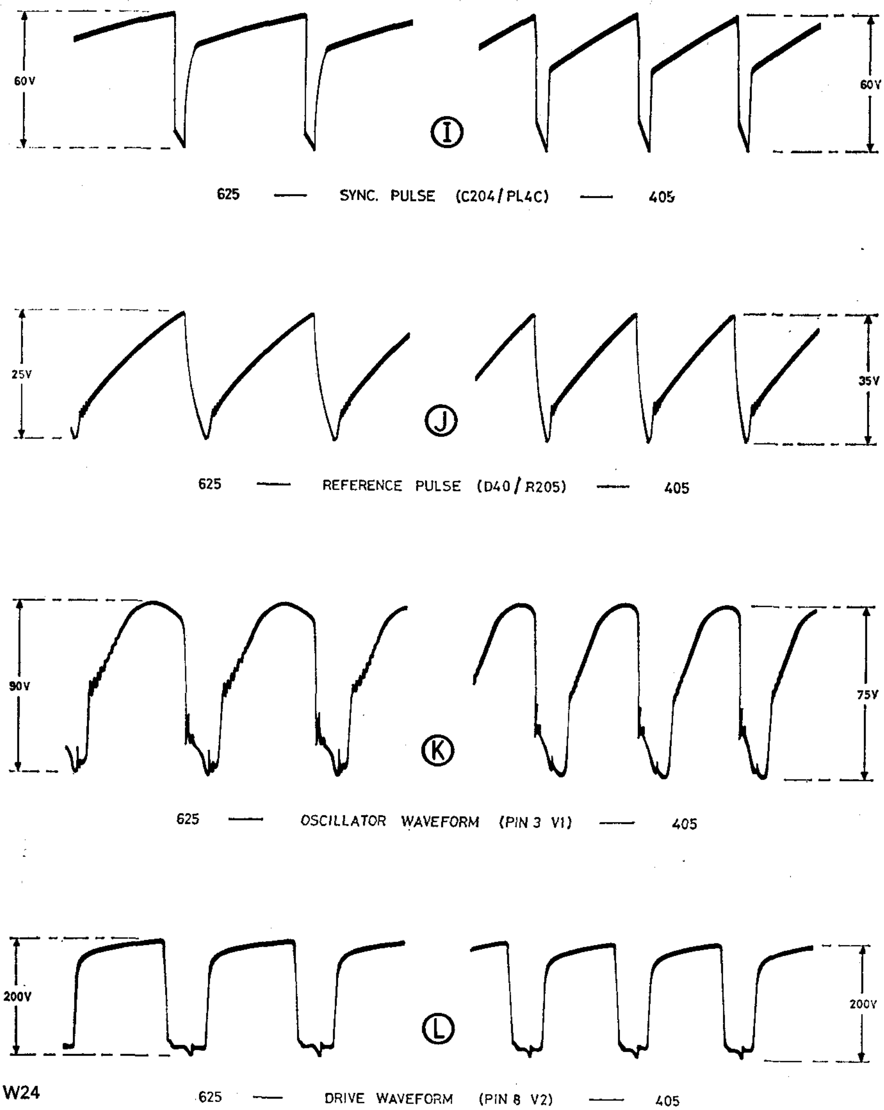


(W23) Frame Timebase Waveforms (Pye CT70 and CT71)

Transistor Voltage Analysis:

I.F. Panel: *Conditions:* All voltages (except VT6 collector) taken with Avo 8 on 25 V range whilst receiving colour test card. Readings in brackets are those which differ under "no signal" conditions. Supply at PL3C = −24V.

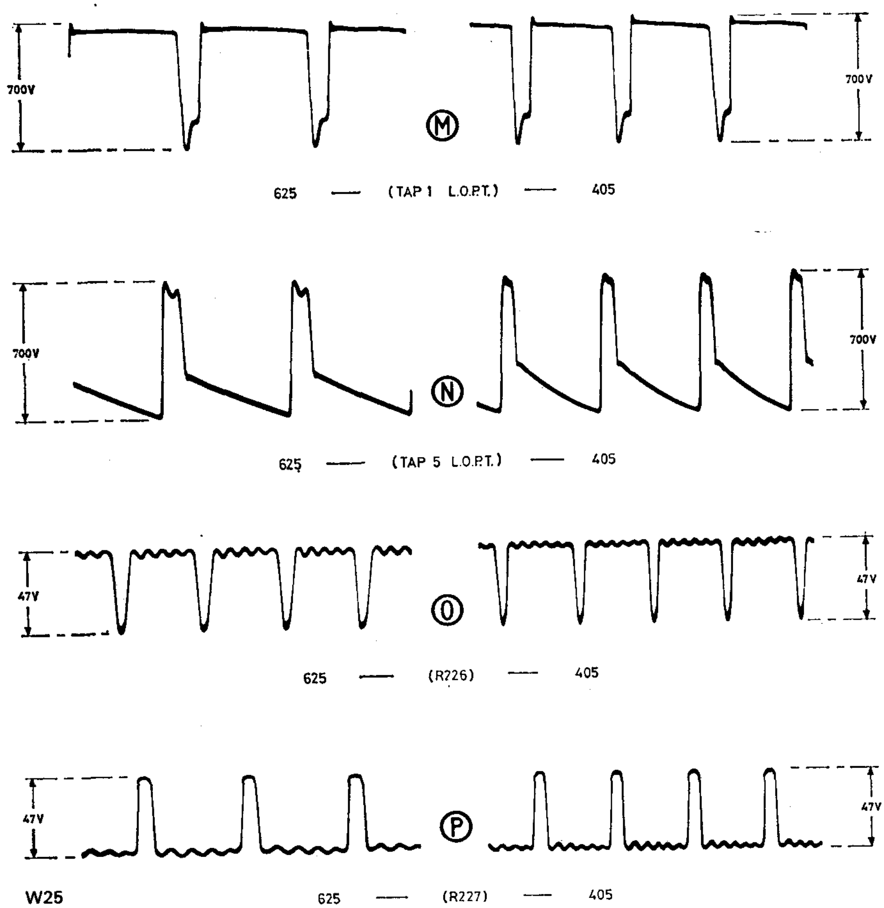
Stage	*C*	*B*	*E*
VT1	− 8·6 (− 7·5)	−13·0 (−14·5)	−13·8 (−16·5)
VT2	—	−14·2	−15·0
VT3	—	−14·2	−15·0
VT4	− 4·2 (− 2·0)	−15·1 (−17·4)	−15·7 (−18·0)
VT5	+13·7	+ 5·8	+ 5·2
VT6	+44·0 (+23·0)	− 0·7 (+ 0·2)	— (+ 0·1)
VT7	−10·5 (− 8·2)	−17·0 (−18·7)	−16·4 (−16·7)
VT8	−12·9 (−18·2)	−17·2 (−17·3)	−17·9 (−18·2)
VT9	—	−15·6	−16·4
VT10	− 0·5	−14·6	−15·2
VT11	+15·7	+ 3·2	+ 3·0



(W24) Syncronized and Oscillator Waveforms (Pye CT70 and CT71)

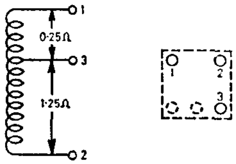
Decoder Panel: *Conditions:* All voltages taken on Avo 8 with respect to earth line. Normal input, 6 dB down on maximum saturation. Letters in parentheses indicate Avo range—(a) 2·5 V; (b) 10 V; (c) 25 V.
Supply at PL8A = −20 V and at PL8B = +15·3 V.

Stage	*C*	*B*	*E*
VT12	13·8 (c)	0·68 (a)	—
VT13	15·0 (c)	0·9 (a)	0·35 (a)
VT14	15·0 (c)	0·06 (a)	0·75 (a)
VT15	5·0 (c)	0·31 (a)	0·38 (a)
VT16	11·5 (c)	4·75 (c)	3·75 (c)
VT17	11·5 (c)	3·38 (b)	3·1 (b)
VT18	13·2 (c)	1·78 (a)	1·81 (a)
VT19	13·6 (c)	4·05 (b)	5·2 (b)
VT20	8·8 (b)	3·1 (b)	2·48 (b)
VT21	12·2 (c)	5·3 (b)	4·7 (b)
VT22	5·8 (b)	0·39 (c)	—
VT23	5·8 (b)	0·39 (c)	—

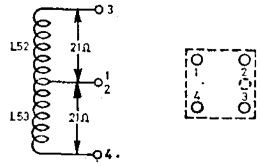


(W25) Line Output Waveforms (Pye CT70 and CT71)

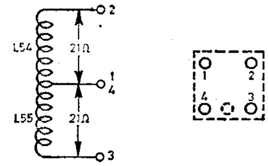
(W27) (opposite) Resistance of C.R.T.Coils (Pye CT70 and CT71)



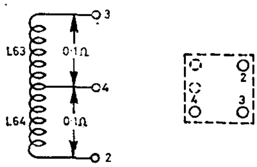
L51,56
625 & 405 BLUE PARABOLA



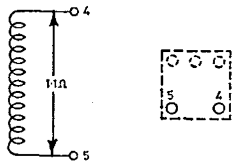
L52,53
625 BLUE LATERAL AMP.



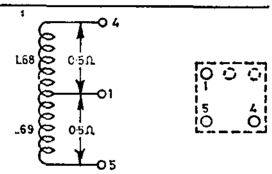
L54,55
405 BLUE LATERAL AMP.



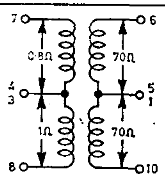
L63,64
R/G TILT



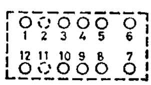
L67
405/625 PIN CUSHION CORRECTOR



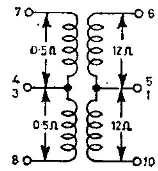
L68,69
405-625 R/G LINE SYMMETRY



TYPE AT4041/03
(EARLY PRODUCTION)

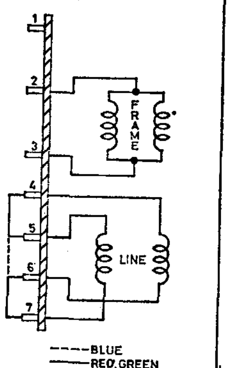


T20
TRANSDUCTOR

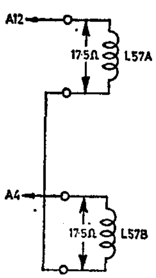


TYPE AT4041/05
(CURRENT PRODUCTION)

LINE COILS-2Ω (PER COIL)
FRAME COILS-415Ω (PER PAIR)

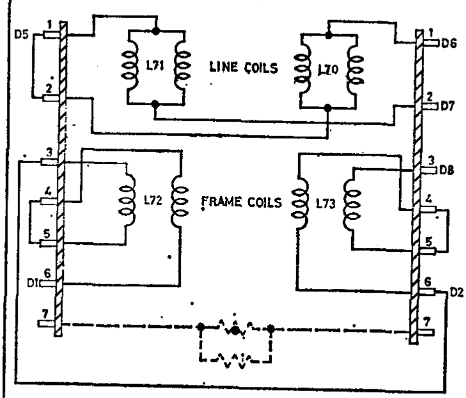


L58A-L66B
CONVERGENCE COILS



L57A-L57B
BLUE LATERAL MAGNET

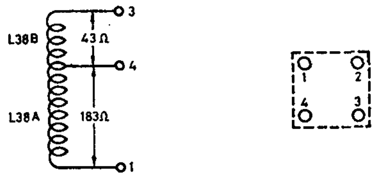
LINE COILS-2·8Ω (PER PAIR)
FRAME COILS-14Ω (PER COIL)



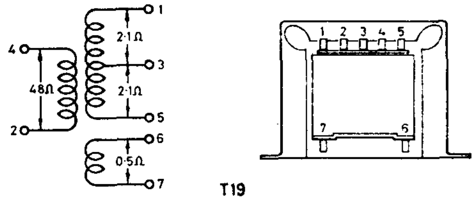
DEFLECTOR COILS L70-L73

W27

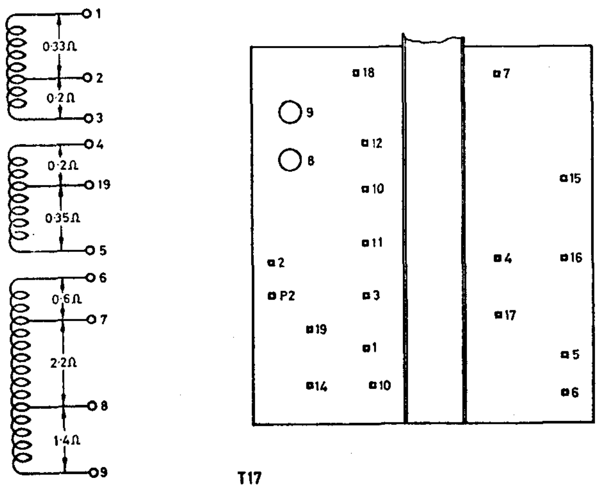
CONNECTIONS TO COIL BASES SHOWN FROM COPPER SIDE OF PANEL



L38A—B
LINE OSCILLATOR



T19
MAINS TRANSFORMER



T17
LINE OUTPUT TRANSFORMER

W26

(W26) Resistance of Transformer Windings (Pye CT70 and CT71)

Colour Difference Amplifier: All voltages taken with Avo 8, receiving colour test card. H.T. = +285 V. Supply at PL11A = +20V and at PL11B = −20 V.

Pin	*V6*	*V7, V8 & V9*	*Stage*	*C*	*B*	*E*
1	+1·25	+74	VT28	+ 0·4	+0·6	—
2	varies with B & C	+62	VT29	+13·4	—	−0·65
3	—	+107	VT30	+17·8	—	−0·68
6	—	+147 — +160	VT31	+16·7	—	−0·7
7	+216	+4·2				
8	+205	—				
9	+1·25	+210				

Line Timebase: All voltages taken with Avo 8, switched to 625. H.T. = +285 V. Boost = 710 V.

Pin	*V1*	*V2*	*V3*	*V5*
1	+218	—	—	+285
2	− 29	0 — +2·1	—	—
3	+207	—	—	—
6	+129	+208	—	—
7	+2	—	+285	—
8	varies with line hold	−67	—	+270
9	+0·45	0 — +2·1	—	—

Frame Timebase: All voltages taken with Avo 8. H.T. rail to rail = 42V.

Stage	*C*	*B*	*E*
VT24	− 1·6	−22·4	−21·0
VT25	−21·0	−18·7	−18·8
VT26	+21·0	+ 6·0	+ 5·0
VT27	+ 3·0	−18·8	−19·4

SOBELL Models 1028, 1028A, 1029 and 1029A

General Description: These models are covered by the information given on the G.E.C. models 2028, 2028A, 2029 and 2029A, in this and the 1967–68 volume. Full service information is featured in this volume on earlier pages, which may also be used in conjunction with information given in the earlier volume.

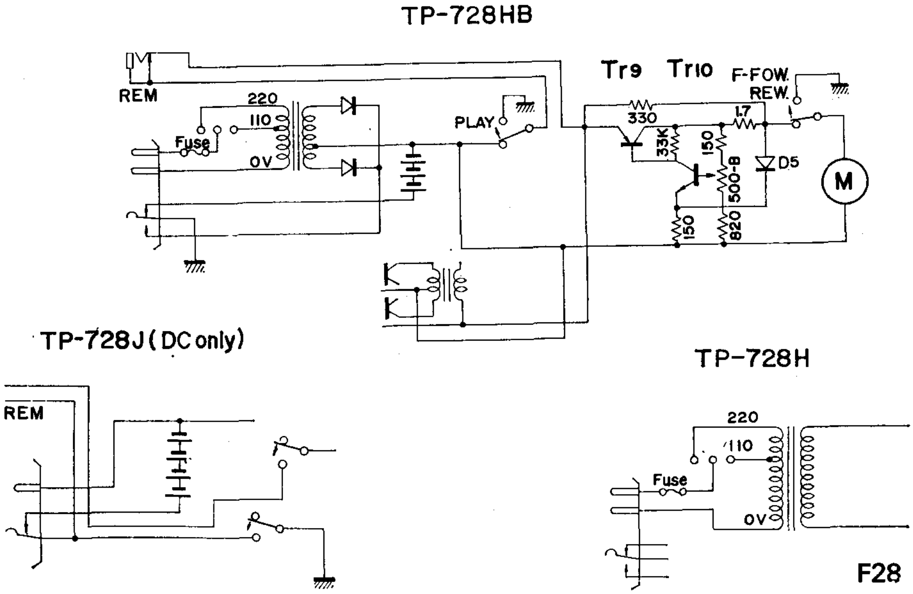
TAPE RECORDER SERVICING

ACKNOWLEDGEMENTS

Aiwa Co. Ltd.
British Radio Corporation Ltd.
Combined Electronic Services Ltd.
Fidelity Radio Ltd.
Sanyo Service and Sales

AIWA — Model TP728

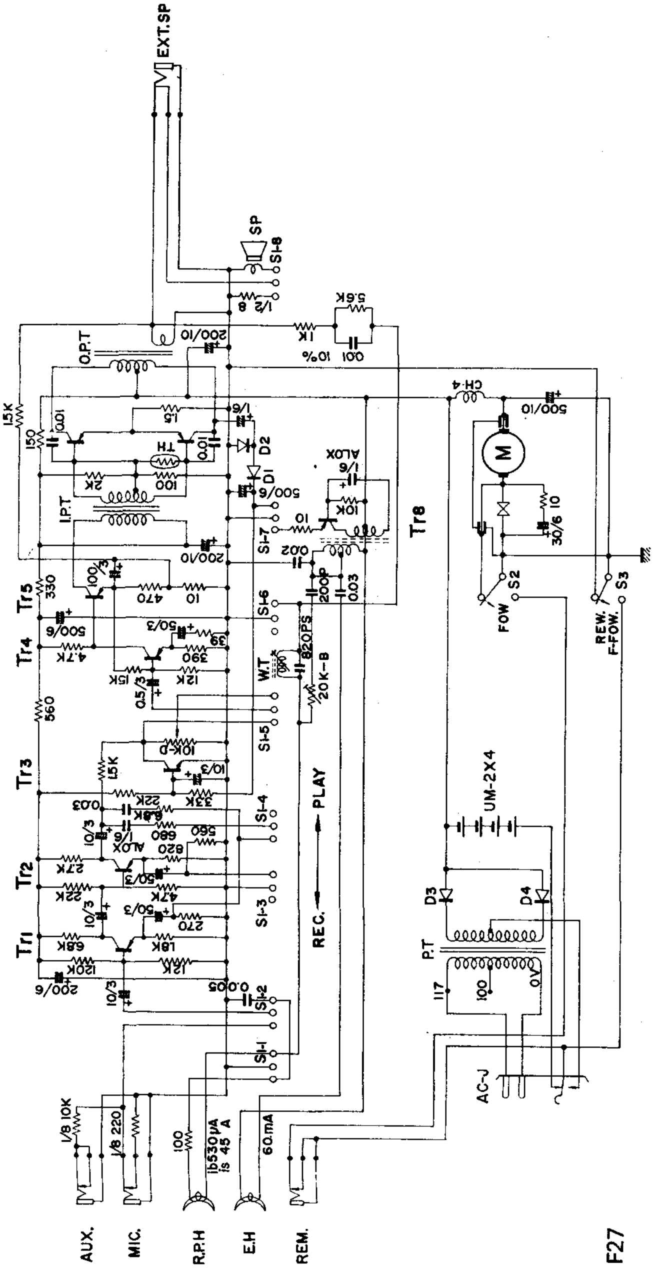
General Description: Eight transistor plus four diodes cassette loading dual-track tape recorder. Power supplies: 4 × 1·5 V batteries or A.C. mains. Audio frequency output 1 W.



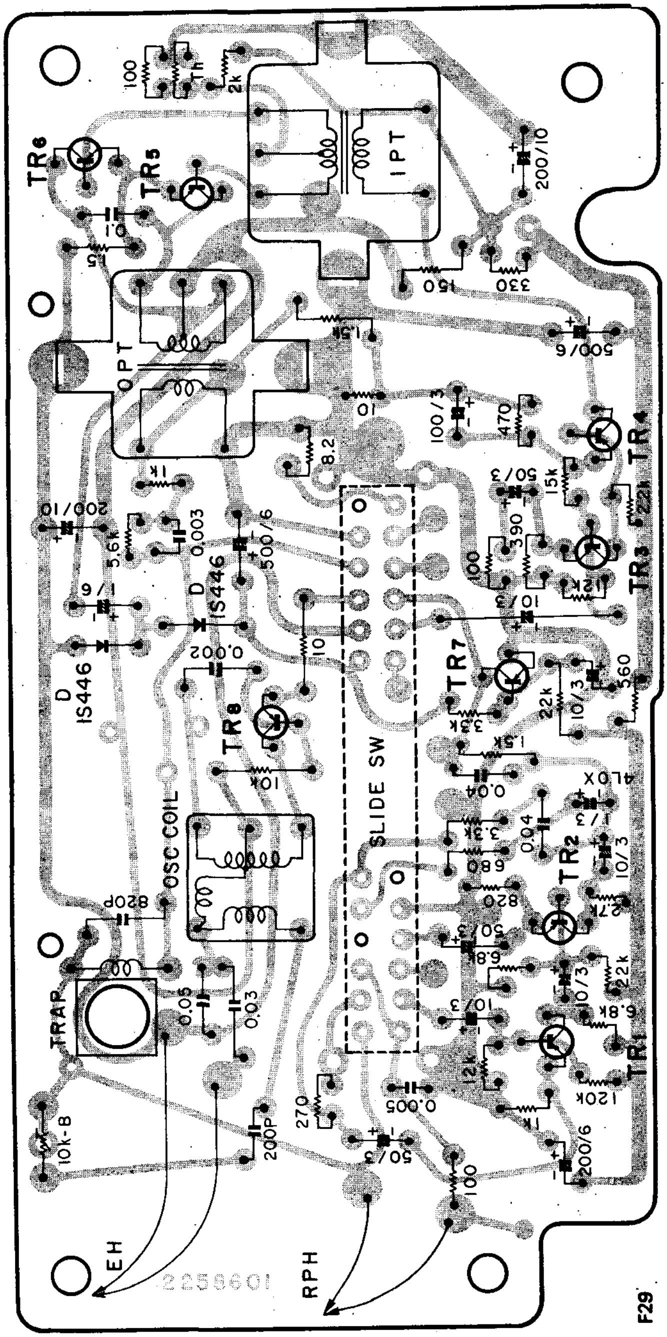
(F28) Circuit Modifications—TP728 Series

Capacitors:

Part No.	Description	Quantity	H	J	HB	C	Remarks
8332220	Electrolytic capacitor	1	1	1	1	1	200 μF 6 WV
8331120	Electrolytic capacitor	1	1	1	1	1	100 μF 3 WV
8331510	Electrolytic capacitor	3	3	3	3	3	50 μF 3 WV
8332310	Electrolytic capacitor	1	1	0	0	1	30 μF 6 WV
8331110	Electrolytic capacitor	4	4	4	4	4	10 μF 3 WV
8332100	Electrolytic capacitor	1	1	1	1	1	1 μF 6 WV
8332520	Electrolytic capacitor	1	1	0	0	1	500 μF 10 WV
7015033	Arox capacitor	1	1	1	1	1	0·5 μF 6 WV
7015048	Arox capacitor	2	2	2	2	2	1 μF6 WV
8727840	Mylar capacitor	1	1	1	1	1	0·03 μF
8727720	Mylar capacitor	1	1	1	1	1	0·005 μF
8727800	Mylar capacitor	1	1	1	1	1	0·02 μF
8727810	Mylar capacitor	3	3	3	3	3	0·01 μF
8517580	Styrol capacitor	1	1	1	1	1	820 pF
8212470	Ceramic capacitor	1	1	1	1	1	200 pF
8132159	Electrolytic capacitor	1	1	1	1	1	500 μF 10 WV
8142829	Electrolytic capacitor	2	2	2	2	2	500 μF 6 WV
8122103	Electrolytic capacitor	2	2	2	2	2	200 μF 10 WV



(F27) Circuit Diagram—Models TP728 and 728C



F29

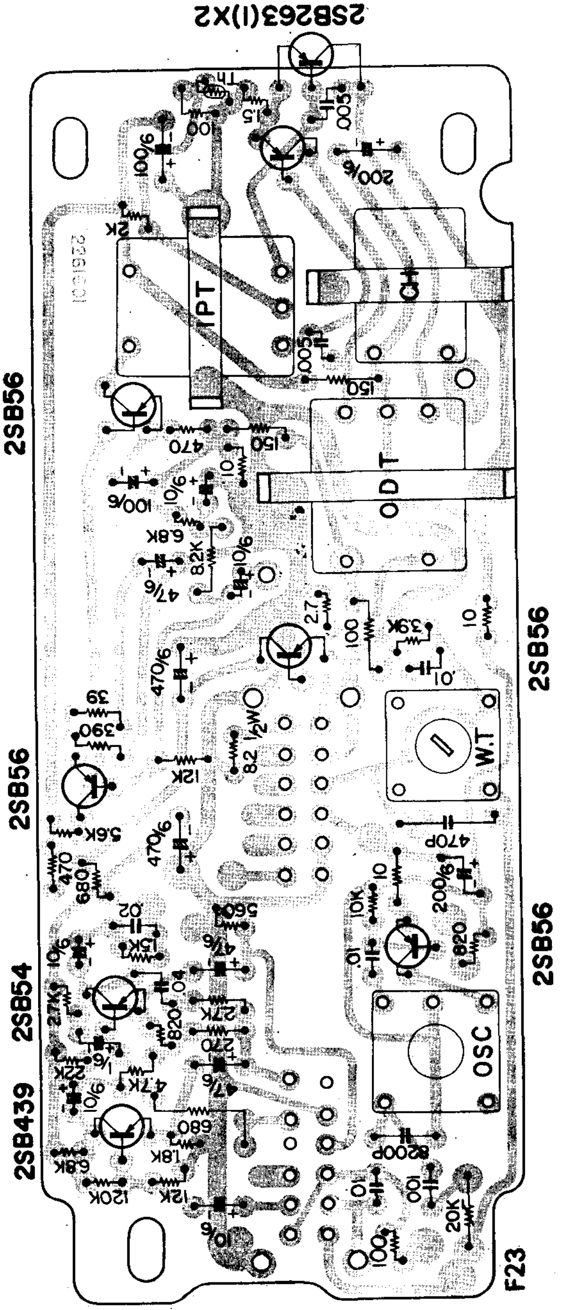
(F29) Printed Circuit Layout—TP728 Series

Resistors:

Part No.	Description	Quantity					Remarks
			H	*J*	*HB*	*C*	
8132124	Fixed resistor	1	1	1	1	1	120kΩ
8132223	Fixed resistor	2	2	2	2	2	22kΩ
8132153	Fixed resistor	1	1	1	1	1	15kΩ
8132123	Fixed resistor	2	2	2	2	2	12kΩ
8132103	Fixed resistor	1	1	1	1	1	10kΩ
8132682	Fixed resistor	2	2	2	2	2	6·8kΩ
8132562	Fixed resistor	1	1	1	1	1	5·6kΩ
8132332	Fixed resistor	1	1	1	1	1	3·3kΩ
8132272	Fixed resistor	1	1	1	1	1	2·7kΩ
8132202	Fixed resistor	1	1	1	1	1	2kΩ
8132152	Fixed resistor	2	2	2	2	2	1·5kΩ
2258618	Fixed resistor	1	1	1	1	1	1kΩ
2258619	Fixed resistor	1	1	1	1	1	820Ω
7035028	Fixed resistor	1	1	1	1	1	680Ω
7064025	Fixed resistor	2	2	2	2	2	560Ω
7031080	Fixed resistor	1	1	1	1	1	470Ω
7064015	Fixed resistor	1	1	1	1	1	380Ω
7032003	Fixed resistor	1	1	1	1	1	330Ω
8132102	Fixed resistor	1	1	1	1	1	270Ω
8132821	Fixed resistor	1	1	1	1	1	150Ω
8132681	Fixed resistor	2	2	2	2	2	100Ω
8132561	Fixed resistor	3	3	2	2	3	10Ω
8132471	Fixed resistor	1	1	1	1	1	1·5Ω
8132391	Fixed resistor	1	1	2	2	1	82Ω
8132331	Fixed resistor	1	1	1	1	1	10Ω
8132271	Fixed resistor	1	1	1	1	1	220Ω
8132151	Fixed resistor	2	2	2	2	2	4·7kΩ
8132101	Fixed resistor	1	1	1	1	1	1·8kΩ
8132100	Fixed resistor	1	1	1	1	1	39Ω

List of Transistors, Diodes and Thermistor:

Part No.	Description	Quantity					Remarks
			H	*J*	*HB*	*C*	
8024390	Transistor	1	1	1	1	1	2 SB 439
8020540	Transistor	1	1	1	1	1	2 SB 54
8020560	Transistor	3	3	3	3	3	2 SB 56
8031825	Transistor	1	1	1	1	1	2 SC 182 (5)
8022631	Transistor	2	2	2	2	2	2 SB 263 (1)
8052446	Diode	2	2	2	2	2	1 S 446
7027039	Diode	2	2	0	2	2	10 D-1
7026008	Thermistor	1	1	1	1	1	KD-13

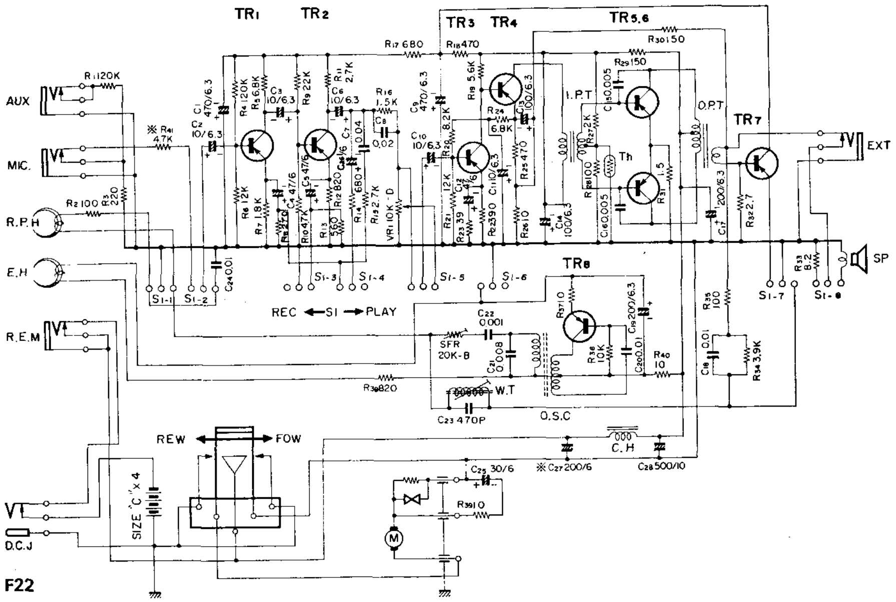


(F23) Printed Circuit Layout—Models TP736 and TP739

AIWA — Models TP736 and TP739

General Description: Eight transistor dual-track cassette loading tape recorder. 4 × 1·5 V batteries or A.C., with the use of an adaptor, power supplies. Audio frequency output 1 W maximum. A.C. bias and D.C. erase are used.

Note: The tape deck is mechanically similar to the AIWA model TP737 player (following) in this volume.

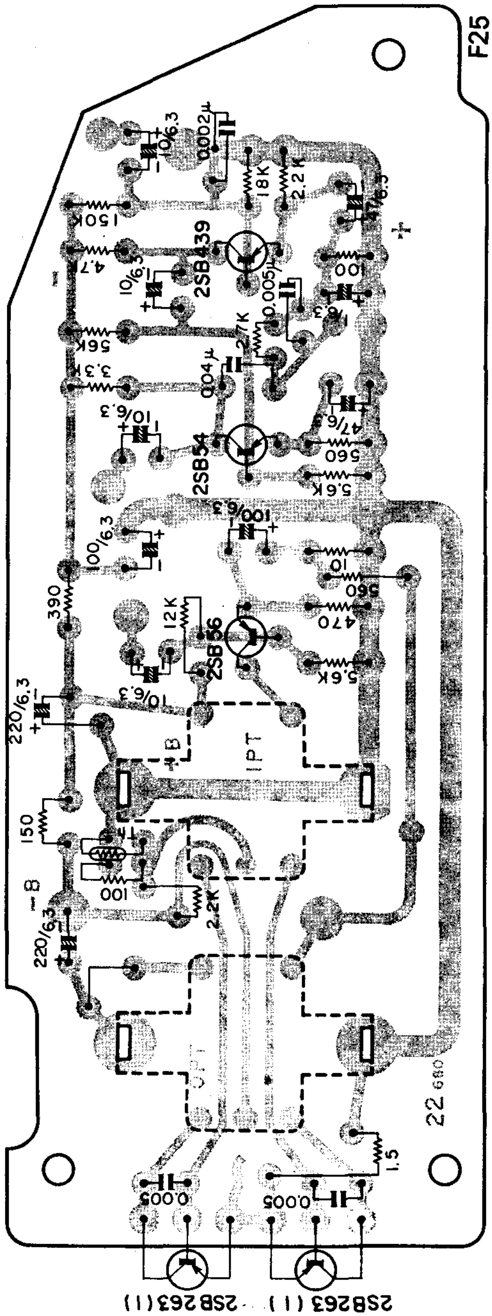


(F22) Circuit Diagram—Models TP736 and TP739

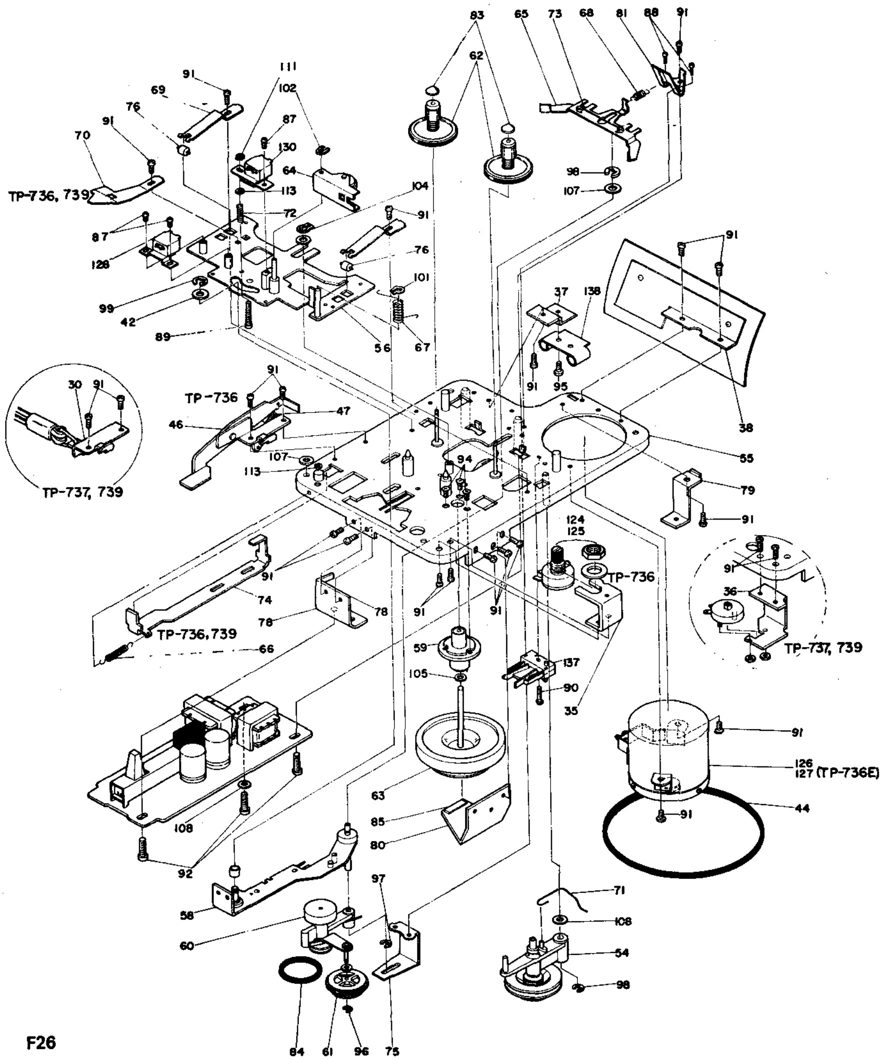
AIWA — Model TP737

General Description: A five transistor dual-track cassette loading tape player. Power supplies are 4 × 1·5 V batteries or A.C. mains when used with an adaptor. Audio frequency output 1 W maximum.

List of Mechanical Parts: A parts list and diagrams appear on the following pages.



(F25) Printed Panel Layout—Model TP737

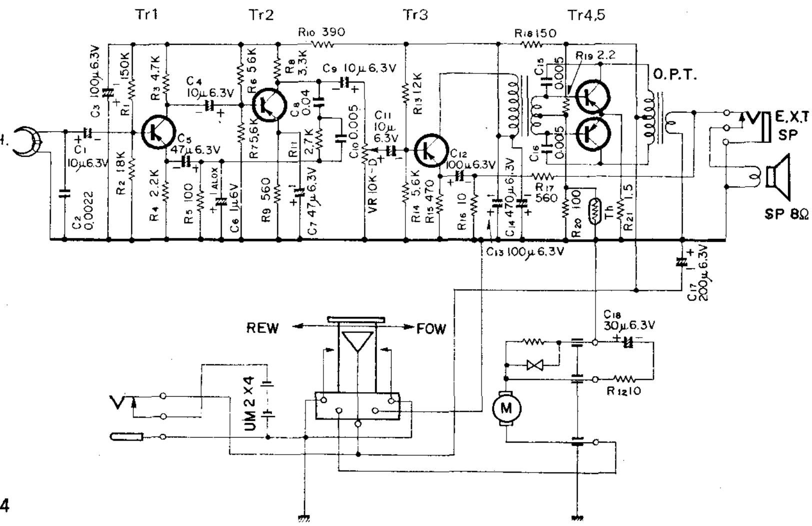


F26

(F26) Mechanical Layout of Tape Deck—Model TP737. The Parts Shown on the Diagram are Listed Below and Overleaf

Ref. No.	*Part No.*	*Description*
30	22690081	Carrying strap assembly
31	22660130	Screw, handle
35	22662040	VR holder
36	22672040	VR holder
37	22662100	R holder
38	22662060	Battery holder plate assembly, battery room
42	22612150	Battery terminal plate, battery room
44	22612840	Main belt

Ref. No.	*Part No.*	*Description*
46	22662010	Cassette-up lever assembly
47	22662080	Cassette-up lever spring
54	22662161	Take-up pulley assembly
55	22612792	Chassis assembly
56	22612761	Slide chassis assembly
58	22612110	Main lever assembly
59	22612320	Shaft bearing assembly
61	22612410	Actuating pulley B assembly
62	22612850	Reel platform assembly
63	22154850	Flywheel assembly
64	23412020	Pinch roller lever assembly
65	22152330	Brake arm assembly
66	22154710	Record-preventing interlock spring
67	22153340	Pinch lever spring
68	22155550	Brake spring B
69	22612220	Click spring
70	22612250	Record knob spring
71	22612780	Take-up arm spring
72	22612750	Head adjuster spring
73	22152360	Brake spring A
74	22612190	Record-preventing interlock lever
75	22612200	Main lever guide
76	22612231	Click roller
78	22612830	Back lid holder plate
79	22612070	Back lid mount
80	22612300	Flywheel mount
81	22612460	Cassette stopper
83	22541400	Cap, reel platform
84	22153020	Square belt, 10B
85	22153270	Flywheel shaft bearing
87	72630320	Pan-head screw, V+2-3S
88	72630340	Pan-head screw, V+2-5S
89	72630400	Pan-head screw, V+2-15S
90	72630360	Pan-head screw, V+2-8S
91	72630710	Pan-head screw, V+2.6-4S
92	72630931	Pan-head screw, V+3-5S
94	72330340	Countersunk-head screw, Q+2-5S
95	72530710	Bind screw, U+2.6-4S
96	74410010	E stop ring, STE-1.2
97	74410030	E stop ring, STE-1.5
98	74410040	E stop ring, STE-1.9
99	74410060	E stop ring, STE-2.3
101	74420030	Stop ring, STP-3
102	74420020	Stop ring, STP-2
104	74420040	Stop ring, STP-4
105	70810360	Tefron washer, TW2-5-0.2
107	74103150	Washer, W-3-0.5
108	70810150	Washer, WF-3-8-0.5
111	73911050	Nut, N-2-4-1.6
113	74103050	Washer, W-2-6-0·4



F24

(F24) Circuit Diagram—Model TP737

FERGUSON Model 3236

General Description: This model is electrically similar to the H.M.V. model 2236, which is later described in this volume.

FERGUSON Model 3236 Sch C

General Description: This model is electrically similar to the H.M.V. model 2236, schedule C, which is described in this volume.

FERGUSON Model 3238

General Description: Three-speed, four-track tape recorder. This model employs the Thorn type DC43 tape deck which is described in the 1967–68 volume. Monitoring: input signals through internal or extension loudspeaker. Input mixer: PU input may be mixed with MIC, RAD or PU2. Straight-through amplifier: with "record" key depressed and tape stationary. MIC input: 1·5 mV into 10 M. Sockets: extension loudspeaker, radio in/out, PU2 input, PU input and auxiliary. Extension loudspeaker: 3 Ω at 3 W. Dual purpose extension loudspeaker socket providing switched or unswitched internal loudspeaker. Radio in/out: input 1·5 mV into 68 k (pins 1, 4 and 2), output 1 V at 22 k (pins 3, 5 and 2). PU2 input: 75 mV into 3·3 M (pins 1, 3, 5 and 2). PU input: 180 mV into 200 k–500 k (pins 1, 3, 5 and 2). Auxiliary socket—see text.

Access for Service: To gain access to the top of the tape deck for routine cleaning, etc., first pull off the speedchange and amplifier control knobs, take out screw securing the moulded head cover then remove screws securing the moulded top cover. Lift and carefully ease the top cover forward to clear the tape deck operating keys. If difficulty is encountered when removing control knobs, a piece of stout coarse string knotted as a clove hitch and wound around the shank of the knob, will assist. With strong outward tension applied to the ends of the string an upwards movement will release the knob.

Chassis Removal: To remove chassis from cabinet, take off control knobs and tape deck covers as described, then take out two domehead screws from each side of the mechanism top cover. Lift the chassis slightly forward to allow top of storage compartment panel to be released from slot in cabinet rail, then lift complete chassis assembly upward within the limit of the loudspeaker leads. Disconnect loudspeaker lead plugs to enable chassis to be withdrawn completely from the cabinet.

Printed Board: Most meter checks and component replacements may be carried out with the printed board *in situ.* Place the cabinet with the handle

uppermost, then remove the bottom cover and also the metal baseplate from the printed circuit board. To release printed board, detach circlip and washer from stud on record switch link. Remove four screws and washers securing printed board then spring one end bracket outward to release board which may then be hinged outward within wiring limits.

Note: When reassembling do not forget to correctly locate S2 speed compensation switch spindle, and the slide switch operating stud into the eye in the record switch link, then replace washer and circlip.

Removal of Electrical Assemblies: Remove tape indicator assembly to avoid risk of breaking trip button when recorder is inverted, then prop recorder chassis on its rear side.

Before dismantling component parts unsolder the following: Leads from lampholder (brown and brown/white). Lead from tag 34 on printed board (black) also lead from tag 35 (orange). Meter leads from tag 23 (blue or black) and tag 24 (red). White lead from tape foil "stop" contact. Screened lead (to cableform) from S7A contact 1, and screening braid from S7C contact 3. Screened lead (to track switch, S8) from tag 15 and screening braid from tag 14. Solenoid leads. Track switch leads (blue and red) from tag 25 and tag 26 respectively.

Detach microphone socket assembly (2 screws). Remove screen, then note connections before unsoldering and withdrawing leads through hole in chassis.

Remove two screws securing control panel before placing the recorder face downwards on a protective surface. Remove screw to release earth tag and leads from left-hand end bracket. Remove circlip and fibre washer securing record switch link to printed board and take out four screws and flat washers securing printed board to end brackets, then spring one bracket outward to release printed board.

Remove two screws and distance pieces to release muting switch, taking care not to lose muting switch lever and its return spring. Unsolder earth lead from tag under motor fixing bolt, remove screw securing mains lead clamp and detach socket panel assembly (3 screws).

Remove three circlips and flat washers to release motor assembly, take out two fixing screws to release metal rectifier from chassis and also four screws, felt washers and fibre washers securing mains and output transformers. The electrical assemblies can now be lifted away from the tape deck.

Demagnetisation: It is important that there is no residual magnetism in the heads or the capstan spindle. This condition, which may arise if magnetised objects are brought near these components, or if an ohmmeter is connected to the head windings, will lead to an increase in background noise on "play". Suitable instruments for providing a demagnetizing field are available from a number of manufacturers.

Heater Balance: The humdinger (R41) has been set during manufacture and should not be altered unless a valve change is made. If readjustment becomes necessary, the procedure given below must be carefully followed. Whilst setting the adjustment, the chassis must be electrostatically screened particularly around V1. Take off the tape spools and set the instrument to

"record" with the tone control set to minimum and the record level controls set to maximum. Connect a sensitive valve-voltmeter between tag 21 and chassis. Place a shorting lead across C14 to prevent the oscillator functioning and plug in a screened dummy microphone connector with a 100pF capacitor strapped across pins 4 and 5. Allow the machine to warm up for 10 minutes, then adjust R41 for minimum reading on the valve-voltmeter (approximately 50mV).

Head Adjustment: Provision is made on the head mounting for both vertical (height) and horizontal (azimuth) adjustment. Adjustment only becomes necessary where the manufacturing settings have been disturbed.

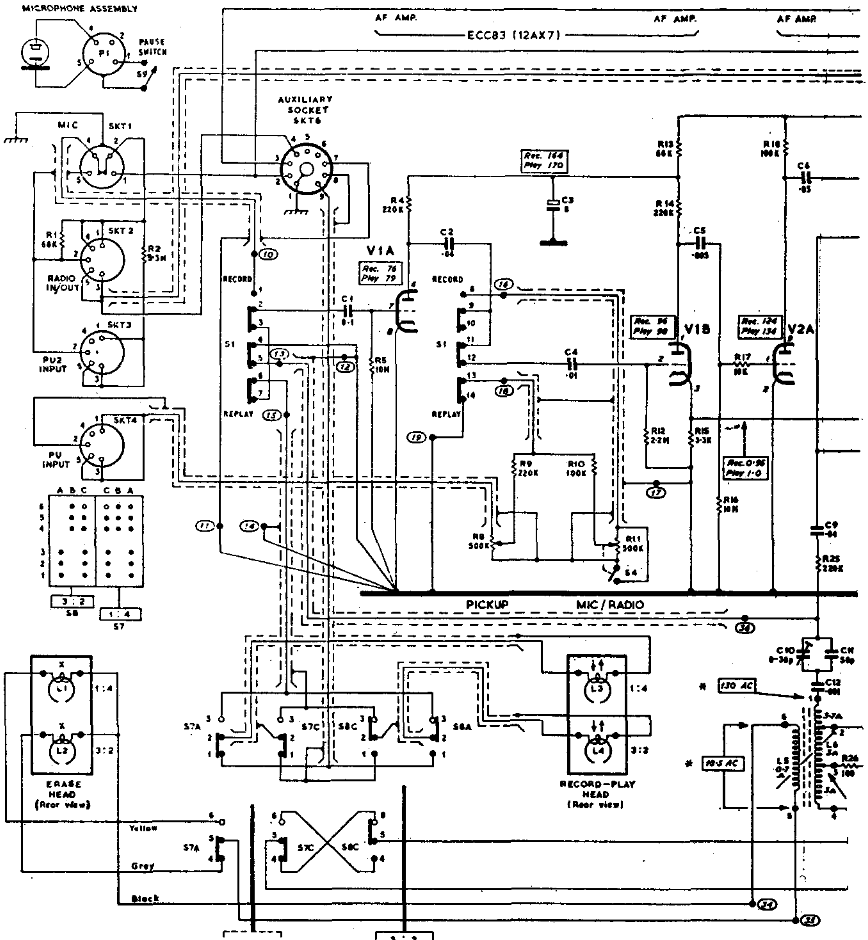
Azimuth—Height Adjustment: The Thorn Height and Azimuth Test Tape Type 6 is used. (This tape may be purchased direct from the manufacturers, Messrs Tutchings Electronics Ltd, 14 Rookhill Road, Frias Cliff, Christchurch, Hampshire.) The method of adjustment requires simultaneous indication for both which is achieved by reading from track 3. Azimuth is correct when the 7·5kHz tone is at maximum and height when the 1·25kHz tone is at minimum. Height is adjusted by turning both screws in the same direction and azimuth by turning in opposite directions. Use the loudspeaker to find the minima of the 1.25kHz tone but, because maxima are difficult to recognise aurally, use a meter to determine the peaks of 7·5kHz tone.

Erase Head: The erase head is accurately located by two rails and a pip moulded into the erase head mount. No adjustment is provided but the head can be simply pushed out rearwards for easy replacement.

Microphone: Due to the possibility of damaging the crystal element, it is suggested that no servicing is carried out on the microphone. In the event of any fault developing in this component, it should be returned to the nearest service depot.

TAG CONNECTIONS

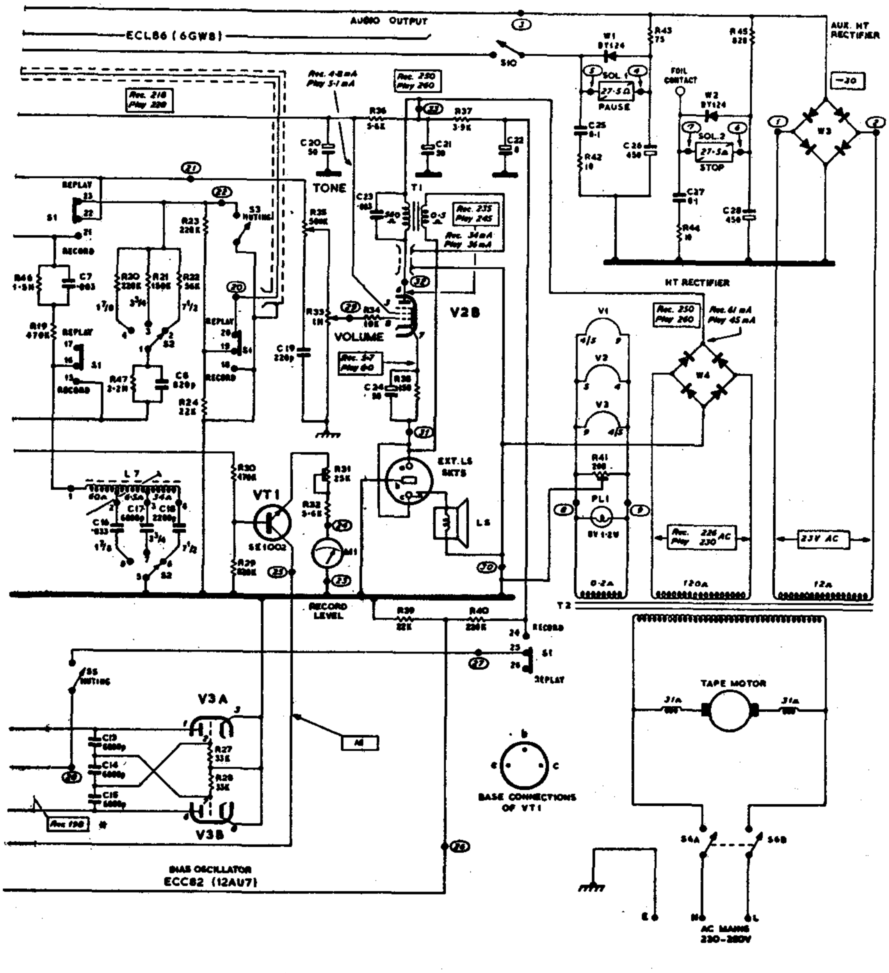
1. To mains transformer H.T. secondary winding
2. To mains transformer H.T. secondary winding
3. To auxiliary socket SKT6, contact 3
4. To rear tag of SOL1
5. To junction of SOL1 and switch S10
6. To inner tag of SOL2
7. To outer tag of SOL2 and also to foil contact
8. To heater winding on T2
9. To heater winding on T2
10. To core of screened lead from SKT1, contact 4
11. To braid of screened lead from SKT1
12. To braid of screened lead from tag 36
13. To core of screened lead from tag 36
14. To braid of screened lead from S8C, contact 3
15. To core of screened lead from S8A, contact 3
16. To top tag of mic./radio control, R11
17. To braids of screened lead from R11 and from junction of R9, R10
18. To core of screened lead from junction of R9, R10
19. To braid of screened lead from SKT2, contact 2
20. To socket SKT2, contact 3
21. To top tag of tone control, R35
22. To muting switch, S3
23. To "earthy" side of record level meter, M1
24. To record level meter, M1
25. To switch S8C, contact 5
26. To switch S7C, contact 5
27. To muting switch, S5
28. To muting switch, S5
29. To slider of volume control R33
30. To junction of R33, C19 and to negative tag of W4
31. To outermost tag on T1
32. To junction of C23 and T1
33. To H.T. supply rectifier W4
34. To junction of erase head coils, L1 and L2
35. To switch S7A, contact 5
36. To tag 13



H71a

(H71A) Circuit Diagram—Model 3238 (Part)

Circuit Diagram Notes: 1. Switches S1, S3 and S5 are shown in "replay" position. 2. Figures in rectangles are voltages measured with a 20,000 ohm/volt meter, except those marked with an asterisk, which are measured with a valve voltmeter. 3. D.C. resistances are shown against inductors where these are 1 ohm or greater. 4. A.C. oscillator voltages were measured with a valve voltmeter. 5. A mains voltage adjustment was fitted in early production recorders only.



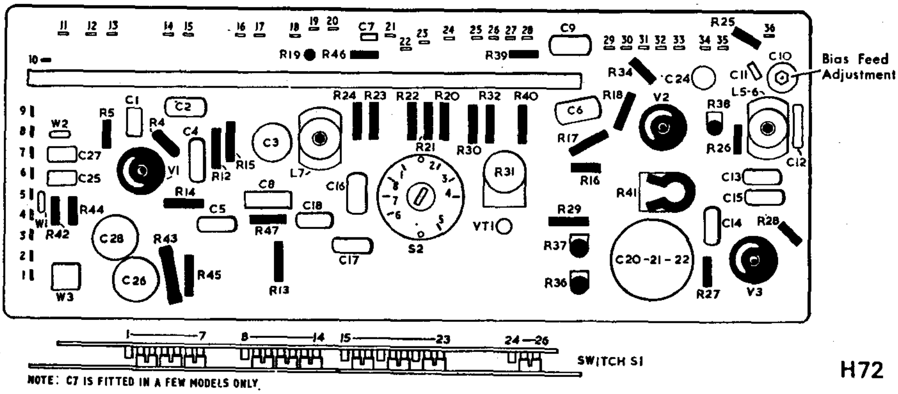
(H71B) CIRCUIT DIAGRAM—MODEL 3238 (CONTINUED)

Power Supplies: The motor is connected across T2 primary which is connected to the mains supply. A separate winding, in T2 secondary, supplies 23 V A.C. to bridge rectifier W3 which has its positive side connected to chassis, thus providing a supply of −30V D.C. This supply is used to operate the "stop" and "pause" solenoids and is also taken to the accessories socket (SKT6) for external use. The solenoids are operated by the discharge of the reservoir capacitors which give a high initial energising current. The "pause"

solenoid is subsequently "held on" by the current through feed resistor R43. The main H.T. supply is provided by a full-wave selenium rectifier (W4) and the parallel heater chain is balanced to chassis by potentiometer R41 across T2 heater winding.

Playback: The appropriate head winding is selected by track selector switches S7A&C and S8A&C, contacts 1–3. The head output voltage is switched by S1 contacts 2 and 3 to V1A grid via C1, the other side of the head winding being returned to chassis via the screening braid. The amplified signal at V1A anode is fed via C2, R6, R7, S1 and C4 to the grid of V1B which with V2A provides two further stages of amplification. A frequency selective feedback loop, switched by speed change switch S2, contacts 1–4 from V2A anode to V1B cathode, gives bass boost playback equalisation. V2A output is fed to the radio output socket (SKT2) via S1 contacts 22 and 23, attenuator R23, R24 and S1 contacts 19, 20 and also to tone control R35. From the tone control the signal is passed via volume control R33 to V2B grid via grid stopper R34. V2B operates as the audio output stage: the secondary of T1 is connected in the return circuit of V2B cathode to provide negative feedback.

Record: The input sockets (SKT1–3) are switched to V1A grid by S1, contacts 1 and 2. Switch contacts are incorporated in the microphone socket to break the radio and pickup input circuits when the microphone is in use. V1A output is fed via C2, S1, contacts 8 and 9, microphone/radio level control R11, R10, S1 contacts 13 and 12 and C4 to V1B grid. Treble boost record equalisation is provided by a frequency selective negative feedback circuit connected between V2A anode and V1B cathode via S1, contacts 22, 21 and 16, 15. V2A output is fed to the appropriate head winding via C6, S1, contacts 22 and 21, C9, R25, S1, contacts 5 and 6 and track switch S7A or S8A contacts 3 and 2. The head windings are returned to chassis via S7C or S8C contacts 2 and 3; the signal is also applied to the grid of V2B for monitoring purposes.



H72

(H72) Component Locations—Model 3238

Part of the signal developed at V2A anode is fed to the base of VT1, the record level indicator rectifier and D.C. amplifier. The transistor metering circuit is employed to eliminate the differential loading imposed by the level meter on the third stage of the amplifier circuit. Power for erasing and recording bias is supplied by V3 which is connected as a push-pull oscillator when the instrument is switched to "record". The oscillator is tuned to approximately 55 kHz and the erase power is fed to the erase head from the bottom of L5 via S7A contacts 4–6. The record bias is coupled to the record-play head via S1, contacts 5 and 6 and S7A or S8A contacts 1–3.

Muting (S3 and S5): When the mechanism is in the fast wind and off positions, V2A output is shorted to earth by S3. When switching from "record" to any other function, S5 opens before contacts 24 and 25 of S1, causing the oscillator output to decay, thus ensuring that the heads are not left partially magnetised.

Playthrough Amplifier: S1, contacts 13 and 12 connect the input from SKT4 when the instrument is used as a "straight-through" amplifier. R8 controls the mixing level of a separate signal fed into SKT4. S7C and S8C contacts 4–6 are required to isolate the record level meter when both track buttons are simultaneously depressed for dual-track replay, preventing record level indication if "record" is accidentally selected under these conditions.

Record Level Meter Calibration Adjustment (R31): Connect a valve-voltmeter between tag 21 and chassis. Depress the "record" key only and apply a 1 kHz signal from an audio oscillator via a 0·1 μF capacitor between tag 10 and chassis, or alternatively into any input socket. Adjust signal input level to give a reading on the output meter of 8 V rms then adjust R31 until the record level meter registers accurately at the junction of the black and red sections of the scale. The meter will now register peak modulation at this point on the scale.

Bias Level Adjustment (C10): Insert a close tolerance 100 Ω resistor in series with, and directly connected to, the "earthy" tag of the record head and connect a valve-millivoltmeter across this resistor. C10 should be set initially to give a bias current of 240 μA, i.e. 24 mV across the 100 Ω resistor. At a level 20 db below peak recording level, make a frequency response recording at $3\frac{3}{4}$ in/sec. Switch to "playback" and check that the frequency response at 14 kHz is within ± 3 dB with reference to the level at 1 kHz. If the result is not within ± 3 dB, C10 must be readjusted. If the response is too high, readjust C10 to increase bias: if too low, readjust to reduce bias. If in order to obtain a frequency response level within ± 3 dB it is necessary to adjust the bias current to a value outside the limits 200—300 μA, i.e. 20—30 mV across the 100 Ω resistor, then it must be assumed that either the record/replay head is faulty or that a fault exists which affects the normal frequency response of the record amplifier, such as misalignment of L7. In any case, the fault must be corrected before attempting to readjust C10.

Record Equalisation Adjustment (L7): Connect a valve-voltmeter between tag 21 and chassis. Depress "record" key only and set speed change control knob to $7\frac{1}{2}$ in/sec. Inject an 18 kHz signal from an audio oscillator via

a 0·1 μF capacitor between tag 10 and chassis or, alternatively into any input socket, and adjust the core of L7 for maximum output.

Preset Adjustments: (*a*) The replacement of C18 will necessitate adjustment of L6. (*b*) C10 will need readjustment if C11 or the record/replay head is replaced. (*c*) R31 will need to be reset if R29, R30, R32, transistor TV1 or the record level meter (M1) is replaced. (*d*) The tuning of oscillator coil L6 (55 kHz) should be checked and, if necessary, returned after a replacement erase head is fitted. All adjustments except C10 are accessible through holes in printed board screening cover. C10 may be reached through hole in end bracket.

Aux Socket (SKT9): This socket is for use with accessories. (*a*) Remote pause operation (pins 1 and 2). (*b*) 30 V D.C. at 50 mA (pins 1 and 3). (*c*) Fully compensated playback signal outlet, 1 V at 22 kΩ (pins 4 and 7). (*d*) Winding on unselected track of record/play head (pins 8 and 9) for: (1) playback of pre-recorded stereo tapes; (2) second-track monitoring; (3) synchronization of automatic slide projector.

Note: If the record/play head push-on clips are disconnected for any reason, it is most important that these are reconnected as shown in the circuit diagram, otherwise the signal phasing will be incorrect for stereo reproduction, e.g. when used in conjunction with BRC Synchro Amp Adaptor TA10. S10 prevents de-energisation of the "stop" solenoid when fast spooling the tape.

FIDELITY "Playmaster"

General Description: Two- or four-track tape recorder with three valves plus rectifier. Single-speed: $3\frac{3}{4}$ in/sec. Amplifier output: 3 W. Frequency range: 60–8000 Hz. Oscillator frequency: 50 kHz. Monitor output: 400 mV at 2 k. External loudspeaker: 3–5 Ω.

Note: The circuit diagram is that of four-track models. Where the circuit of the two-track model deviates from this, the appropriate wiring is shown in dotted line, the differences being connected with the record/play and erase head circuits, S2A and B, R19 being deleted. The voltages shown are those obtained using a type FC116 rectifier. When a type IN4007 rectifier is used, voltages may be slightly higher overall.

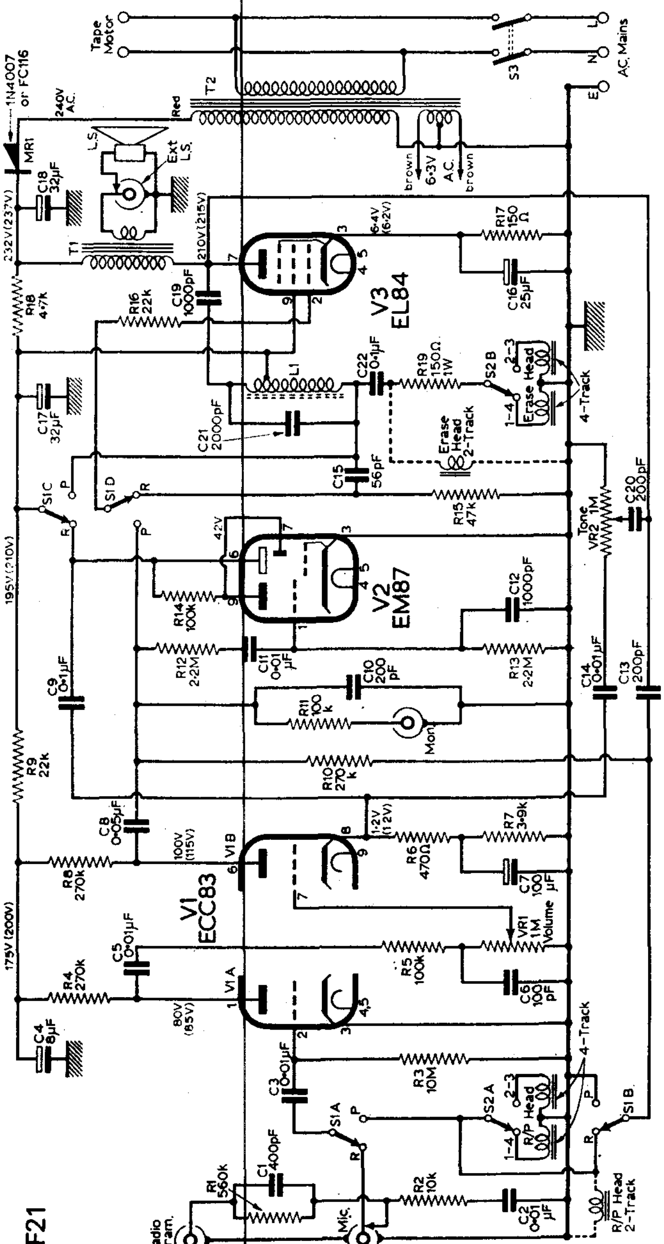
Voltages: Record/play head bias voltage: 55 V (four-track), 65 V (two-track). Erase head voltage: 17 V (four-track), 35 V (two-track). All other voltages measured with Avo model 8. Voltages in brackets are for "play" position.

Recording: In the recording position, microphone input signals are fed into the microphone socket and passed via S1A and C3 to the grid of V1A. Radio or gram signals are fed into the radio/gram socket and the network R1, C1, R2, C2. The amplified signals are passed via C5 to the second triode amplifier V1B. VR1 functions as the recording level control. The V1B output is fed via C8, S1B and S2A to the record/play head to modulate the appropriate track, to the recording level indicator V2 via R12 and C11, and to the monitor socket via R11 to provide monitor facilities during recording or to feed an external amplifier on playback. V3 operates as an anode-tuned erase and bias oscillator, the frequency being determined by L1/C21. Recording bias current is fed to the record/play head via C13 and erase current is fed to the erase head via. C22, R19 and S2B.

Playback: On playback, the output from the record/play head is passed via S2A and S1A to V1A, which operates as a preamplifier. The V1A output is fed to the second triode V1B for further amplification, VR1 acting as the volume control. V3 now operates as the audio output valve, being fed via C8, S1D and R16. The oscillator circuit is rendered inoperative by the action of S1C and S1D, and the recording level indicator V2 no longer operates, the H.T. supply being broken by S1C. Negative feedback is applied from the anode of V3 to the cathode of the triode amplifier V1B via C20, VR2 and C14. Manual tone control is provided by VR2. A socket is provided across the secondary of the output transformer for feeding an external loudspeaker, the connection of which disconnects the internal loudspeaker. H.T. is derived from a half-wave rectifier circuit, with smoothing by C18, R18, C17 and additional decoupling for the first two stages by R9, C4. The valve heaters are fed from a centre-tapped secondary on the mains transformer, the centre tap being taken to earth.

Dismantling: Removal of top moulding (by releasing the five Phillips

F21



(F21) CIRCUIT DIAGRAM—"PLAYMASTER"

screws securing it to casing) will give access to the upper section of the mechanism and limited access to the printed circuit board. For most servicing requirements, however, it will be necessary to effect complete dismantling, procedure as follows:

1. Prise off chrome end caps of carrying handle by inserting a screwdriver or similar tool between the cap and the casing, and levering gently away. A piece of thin metal placed between screwdriver and casing will prevent damage to the casing. Then remove the two countersunk screws thus exposed.

2. Pull off the two control knobs. Five Phillips screws secure the top moulding to the casing; remove these.

3. Turn tape recorder upside down and remove the four Phillips screws in the base. Also remove the two Phillips screws from the back of the casing (Playmaster only). The case can now be lifted off the complete assembly.

Note: Further dismantling should seldom be necessary, but the U-channel over the circuit board can be removed by taking out its two Phillips securing screws and the printed circuit board itself can be taken out to the extent of its connecting leads by removing the four fixing screws.

Reassembly: To reassemble, reverse the above procedure, taking care that the top cover fits into the case all round. The handle caps should be latched on and pressed home.

FIDELITY "Braemar"

General Description: This model is electrically similar to the Fidelity Playmaster already described in the previous pages of this volume. Slight differences in dismantling may be encountered, due to different case fitments.

H.M.V. Model 2236

General Description: Cassette type tape recorder equipped with tape deck type Thorn DE21, which is described in this volume. Bias: A.C. 34kHz. Frequency range: 120Hz–8kHz. Signal to noise ratio: 36dB unweighted. Erasure: better than 70dB (A.C.). Audio power output: 320mW. Record level and battery indicator: moving coil meter. Batteries: 7·5V (minimum 5·5V), five HP11 cells (or equivalents). Battery life: approximately 20 hours at 1 hour per day. Consumption: approximately 100mA. Note that this data refers to instruments in schedules A and B.

Access for Service: Take out batteries and detach back cover (two screws). When dismantling Ferguson model 3236, detach handle (two coin-slotted screws, spacers and spring washers). Model 2236 has no handle but nevertheless the slotted stud on each side of the case must be removed to release the chassis. Pull off volume level control knob and associated felt washer; then, from the battery compartment, remove two screws securing the chassis to the moulded case. When separating the chassis from the case, push back the record button latch (located on the rear left-hand corner of the cassette compartment) to prevent it fouling.

Reassembly: When reassembling the printed board on to the tape deck assembly, ensure that the slide switch locates correctly in the fork of the switch operating lever before tightening the printed board fixing screws. Before refitting the top cover, check that the meter and record button are correctly positioned. Slide the record button interlock bracket towards the loudspeaker to allow it to fit into the slot provided at the top of the cassette compartment.

Meter Sensitivity—R28: This will normally require adjustment only if one of the following has been replaced: M1, R28, R25, R24, R26, C15 or VT14. To adjust, switch to "record", inject 1kHz signal and adjust level control to produce an output of 100mV at junction of C13/R24. Adjust R28 to make meter indicate peak recording level.

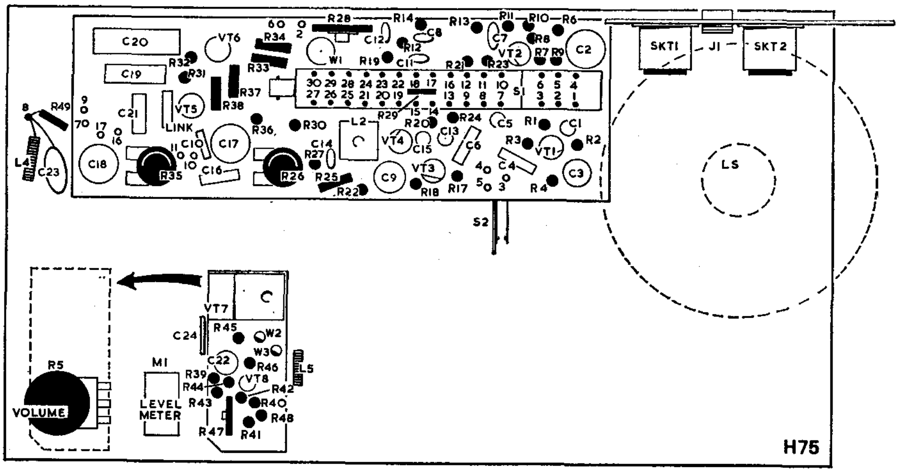
Output Balance Control—R26: Connect an oscilloscope between J1, contact "A" and chassis. Switch to "play" and inject a 1kHz signal between contact 1 and chassis. Set volume control to maximum and increase signal amplitude until clipping of the output waveform occurs. R26 should then be adjusted until clipping is symmetrical on positive and negative peaks.

Bias Filter Coil—L2: This adjustment is accessible through hole in tape deck chassis and must be carried out with printed board *in situ*. Readjustment will normally be required only if R20, C14 or L2 is changed, or if replacement of record/play head necessitates change of bias setting (R35/C16). To adjust L2, switch to "record", turn level control to maximum then adjust core of L2 to give minimum voltage reading at junction of C13 and R24 with no input signal.

A.C. Bias Control—R35: If either head, or any other component affecting the bias oscillator amplitude is changed, R35 will need to be reset. Inject a constant level signal of 10mV (15dB below 1kHz peak recording level) into

the radio input socket through a 1·5 M resistor. Set the level control to maximum and R35 to the centre position. Make recordings at 1 kHz and 8 kHz. Play back and measure the output level at the radio output socket with an electronic voltmeter. The output at 8 kHz should be within the range 0 to −3 dB with reference to the 1 kHz level. If the 8 kHz output is too high, increase the bias; if too low, reduce the bias setting. Repeat the record/play check, and if necessary repeat the complete process to obtain the correct response. If it is found necessary to reduce the bias to a level where the 1 kHz output falls significantly, it must be assumed that a fault exists which affects the frequency response of the amplifier. This must be corrected before attempting to set R35.

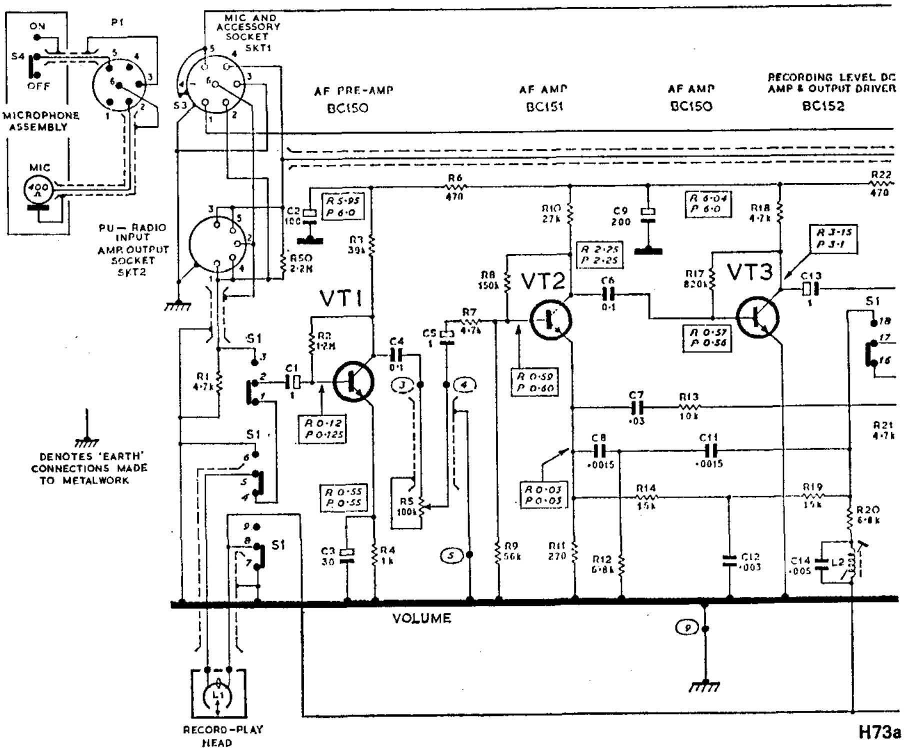
Motor Speed—R47: With new batteries fitted, the speed control R47 is set to give correct frequency playback of a tape pre-recorded with a known signal. Alternatively, the speed may be checked by timing the replay of a known length of tape, and readjusting R47 until the correct result is obtained.



(H75) Component Locations—Model 2236

PRINTED BOARD EXTERNAL WIRING CONNECTIONS

1. To L5, and black lead to motor
2. Yellow lead to record level/battery check meter, M1
3. Red core of screened lead to inner tag of volume control, R5
4. Blue core of screened lead to slider of volume control, R5
5. Screening braid of leads to 3 and 4
6. No external connection
7. To R49
8. Red lead to on/off switch, S2, and grey lead to record level/battery check meter, M1
9. Black lead to chassis earth tag (adjacent to motor)
10. Core of screened lead to J1, contact "A"
11. To screening braid of lead to 10
12. To L4
13. Yellow lead to motor
14. To L5
15. Orange lead to erase head, L3
16. Orange lead to erase head, L3



(H73A) Circuit Diagram—Model 2236 (Schedule B) (Part)

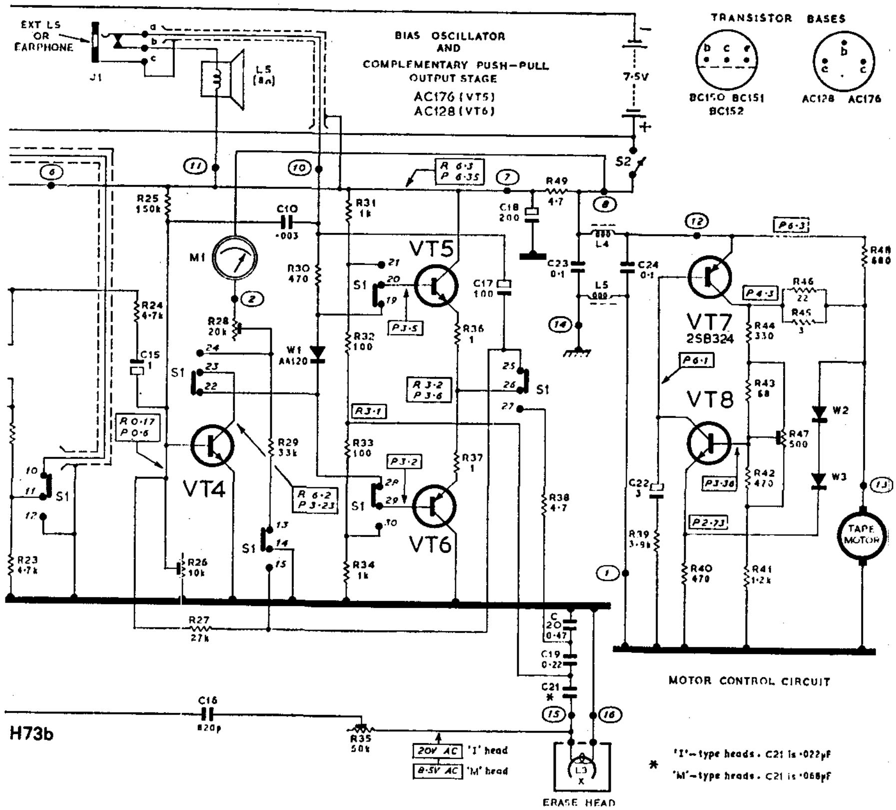
Circuit Diagram Notes: 1. Figures in rectangles are voltage measurements (prefixed "R" for record and "P" for play), taken with a supply line source of 6·5 V, between point indicated and chassis. 2. S1 is shown in the play position. 3. Ringed figures denote printed board external wiring connection points.

Schedule A Models: Separate plugs are used for microphone and remote switch S4, and VT1 input circuit differs as shown. In a few models R50, L23, L24, C23 and C24 are not fitted. "M"-type heads are fitted in all schedule A production, and R35 is 10kΩ. In some models R48 is 680 Ω.

Schedule B Models: When "I"-type heads are fitted, C21 is 0·022 μF; when "M"-type heads are fitted C21 is 0·068 μF. In early schedule B production fitted with "I"-type heads, R35 is 10kΩ and C16 is 50pF, 100pF or 150pF. In some models C9 and C18 are 100 μF, and R13 may be $2 \times 4{\cdot}7$kΩ resistors; R48 is 680 Ω.

Note: "M"-type heads may be identified by the plastic guide pins on the record/play head.

Record: A microphone or radio signal is applied via SKT1 contacts 2 and 6, or SKT2 contacts 1 or 4 and 2. A PU signal is fed via SKT1 contacts 4



(H73b) Circuit Diagram—Model 2236 (Schedule B) (Continued)

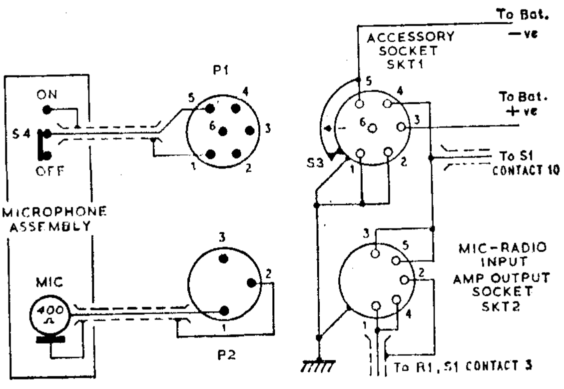
and 6, or SKT2 contacts 3 or 5 and 2. The signal is fed through S1 contacts 2 and 3, and C1 to the base of NPN pre-amplifier VT1. The output from the collector of VT1 is coupled by C4, level control R5, C5 and R7, to the base of NPN first A.F. amplifier VT2. The signal is further amplified by VT3, and the resultant output from VT3 is connected via S1 contacts 17 and 18, R20 and A.C. bias rejector, L2/C14 to the record head which is returned to earth via S1 contacts 5 and 6. Equalisation of the recording characteristic is effected by the correction circuit C8, C11, C12; and R12, R14, R19. Bias and erase power is derived from the push-pull oscillator stage VT5/VT6, the tank circuit of which is formed by the erase head L3 tuned by C19, C20, C21. Tank circuit drive and feedback taps are formed by C20 and C19/20, respectively. Recording bias, derived from the oscillatory voltage across L3 via C16, is controlled by R35. A proportion of the record signal is rectified and amplified by VT4 and fed to M1 the record level meter, via sensitivity adjustment R28.

Playback: The signal from the play head is coupled via record/play switch S1 contacts 4 and 5, and 1 and 2, and C1 to the base of pre-amplifier VT1, contacts 7 and 8 closing to provide the head earth return. The signal is amplified further by audio amplifier stages VT2 and VT3, equalisation of the replay characteristic being effected by C7 and R13. The signal is then fed into the complementary push-pull output stage VT5 and VT6 by driver stage VT4 via S1 contacts 22 and 23. Switch S1, contacts 16 and 17, feeds VT3 output via attenuator R21/R23, and switch S1 contacts 10 and 11, to the accessory socket SKT1 and amplifier output socket SKT2. Meter M1 is switched by S1 contacts 13 and 14, to monitor the battery voltage via R28 and R29.

Motor Control Unit: The circuit serves to maintain motor speed constant with variations of battery voltage and load.

(*a*) *Voltage Stabilisation* Under normal circumstances VT7 bias, provided by VT8 collector current, is set for conduction such that the appropriate voltage is fed to the motor while the effective forward resistance is low compared with R40. Also W2 and W3, the temperature compensation diodes, are forward biased to the constant voltage portion of their characteristics.

If the supply voltage falls, the change is transferred direct to the emitter of VT8. A smaller fall, defined by potentiometer chain R41–42–43–44–47, is applied to the base of VT8, resulting in a net increase in forward bias. The collector current of VT8 rises, driving VT7 on harder, hence reducing its effective series resistance and offsetting the reduction in supply voltage.



H74

(H74) Microphone and Input Circuit—Model 2236 (Schedule A)

(*b*) *Motor Governor Action.* As the load on the motor varies, the armature current drawn will alter in sympathy. This results in a change in P.D. across the motor resistance (the sum of the winding resistance and the electrical equivalent of the friction loss). If the voltage fed to the motor can be altered to offset this change in P.D., the speed will remain constant.

When the load increases, the motor current will increase, causing a rise in the P.D. across R45/R46. This is applied to the base emitter diode of VT8 via

the base potentiometer chain and W2/W3, causing a net increase in the forward bias and a consequent increase in collector current. This turns on VT7 harder and the voltage fed to the motor rises the requisite amount to offset the increase in voltage drop in the system.

(*c*) *Other Considerations.* Resistor R48 by-passes VT7 in order to supply forward bias to VT8 immediately after switch-on. Without this initial forward bias, both VT7 and VT8 would remain permanently cut-off. C22 maintains the average bias level required on the base of VT7. R39 allows VT7 to respond to rapid variations of collector current by allowing the base voltage to fluctuate rapidly around the mean value. A filter comprising L4, L5, C23 and C24 block noise created by the commutator of the tape motor, the H.T. feed to the amplifier being further decoupled by R49 and C18.

H.M.V. Model 2236C

General Description: Cassette type tape recorder, similar to H.M.V. model 2236, which is also described in this volume. The schedule C version can be identified by the schedule markings on the recorder chassis, and a longer main printed board which overhangs the mounting points. Note that the printed board fixing screws are fitted with insulating washers.

Summary of Differences: The following is a summary of the differences between schedule C and earlier schedules:

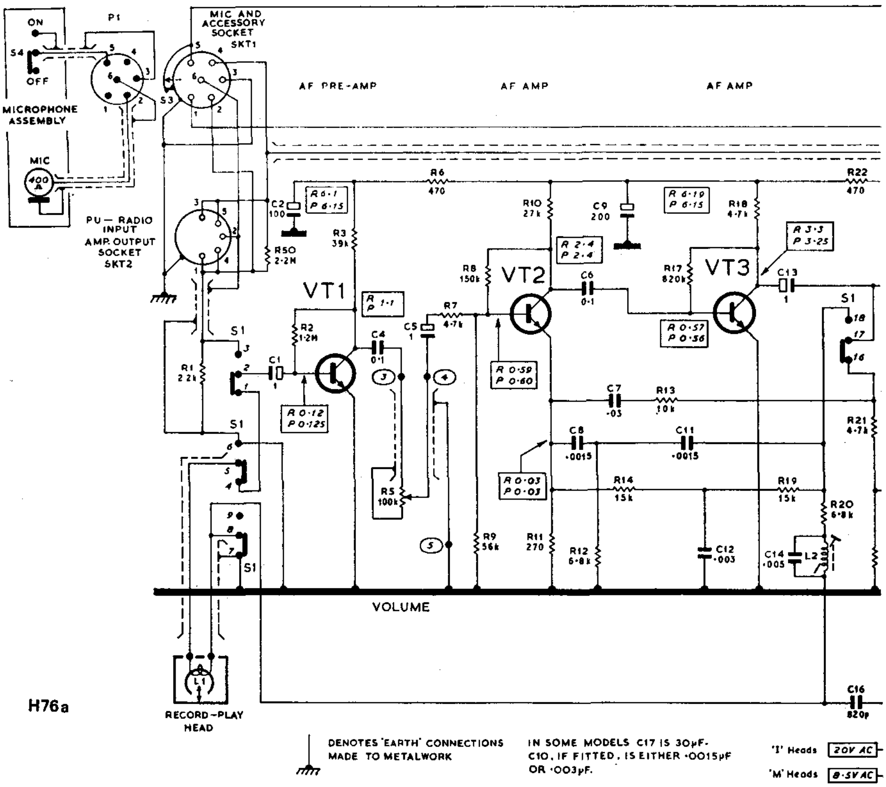
In schedule C models, VT1 stabilising components R4 and C3 are omitted, C10 is now either connected in parallel with R27 or else deleted and the main printed board is lengthened to accommodate L4, L5, C23 and C24 (which were previously attached elsewhere). A 100kΩ resistor is added in series with pin 1 of the DIN plug on the recording connecting lead; C25, C26 are added and positional and value changes are made to R1, R29 and R49.

Capacitor and Resistor Differences:

Reference	*Value*	*Tolerance*	*Rating*	*Function*
C3	deleted			
C10*	1500pF *or*	10%	50V	Playback tone correction
	3000pF	10%	50V	
C17	10μF	Elec.	10V	VT5 feedback
C25	100μF	Elec.	10V	Meter decoupling
C26	100μF	Elec.	10V	Loudspeaker coupling

* In some models C10 is omitted.

R1	2·2kΩ	10%	¼W	Input impedance limiter
R4	deleted			
R29	30kΩ	10%	¼W	Battery state indicator resistor
R30	270Ω	10%	¼W	Part VT4 "playback" collector load
R46	22Ω			Part motor current sampling
R49	220Ω	10%	¼W	Part VT4 "playback" collector load



(H76a) Circuit Diagram—Model 2236C (Part)

Circuit Diagram Notes: Figures in rectangles are voltage measurements prefixed "R" for record and "P" for play. They were based on a supply source of 6·5 V which is the mid point of the useful battery voltage range (5·5–7·5 V). Ringed figures denote printed board external wiring connection points. The record/play switch S1 is shown in the play position.

Input and Output Sockets

The input impedance has been reduced from 3·9 kΩ to 2 kΩ as follows:

Five-pin Socket:

Input: 0·15 mV into 2 kΩ, suitable for microphone or radio, pins 1–4 and pin 2.*

Input: 165 mV into 2·2 mΩ suitable for crystal pickups, pins 3–5 and pin 2.*

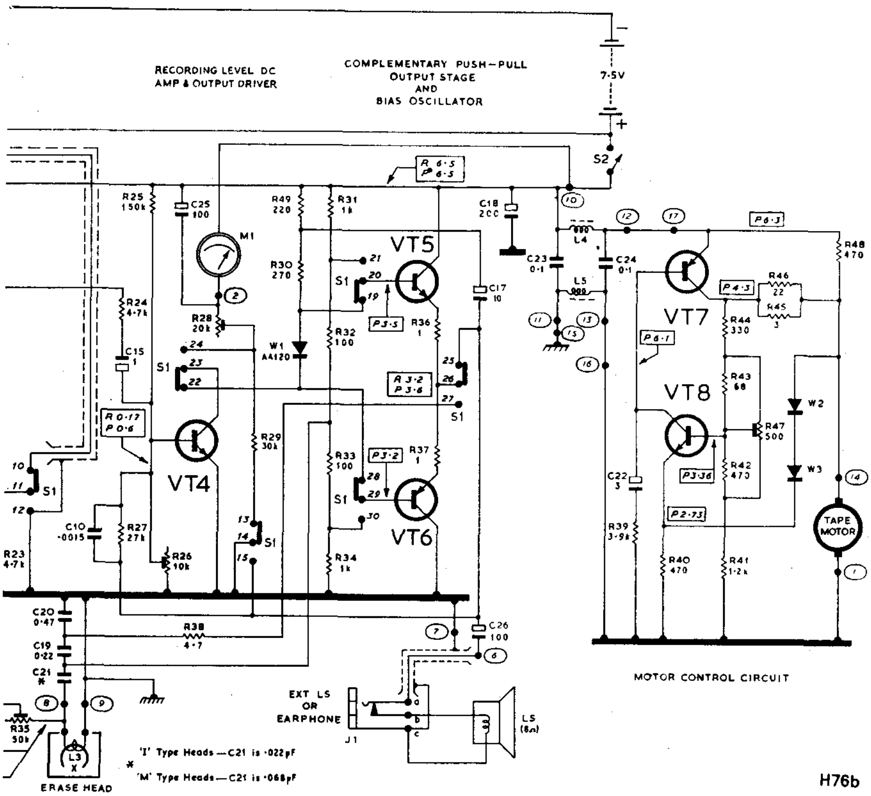
Output: 500 mV at 3·3 kΩ to an external amplifier or radio, pins 3–5 and pin 2.*

Note: The connecting lead supplied with the recorder connects to pins 1–4 and 2 through a series resistance fitted in the plug. With this lead, the effective input sensitivity is 7·5 mV into 100 kΩ.

Six-pin Socket:

Input: 0·15 mV into 2 kΩ for microphone or radio, pin 2 and pin 6.*

* *This pin should be connected to the braiding of the screened connecting lead. There should be no connection between the braid and the metal sleeve of the plug.*



(H76b) Circuit Diagram—Model 2236C (Continued)

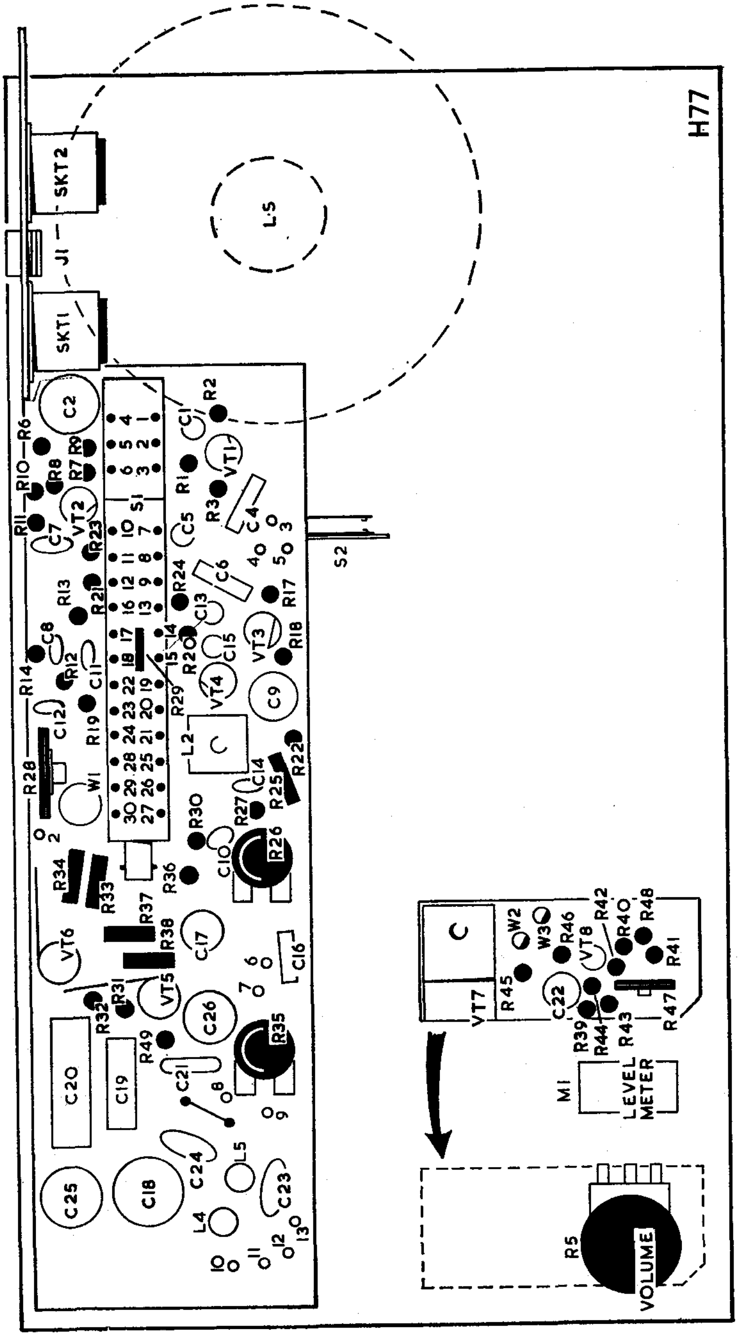
Output: 500mV at 3·3 kΩ to external amplifier or radio, pin 4 and pin 6.*

Stop Start Swich for remote control, pin 3 and 5.

External Power Supply (7·5V), pin 1 positive, pin 3 negative.

Printed Board External Wiring Connections: 1. Black lead to motor. 2. Yellow lead to record level/battery check meter M1. 3. Red Core of screened lead to inner tag of volume control R5. 4. Blue core of screened lead to slider of volume control R5. 5. Screening braids of leads to 3 and 4. 6. Core of screened lead to J1 contact "A". 7. To screening braid of lead to 6. 8. Orange lead to erase head. 9. Black lead to chassis earth tag (adjacent to motor) and orange lead to erase head. 10. Grey lead to meter and red lead to switch S2 11. To chassis via 15 on motor control printed board. 12. To 17 on motor control printed board. 13. To 16 on motor control printed board. 14. Yellow lead to motor. 15. To 11 on main printed board. 16. To 13 on main printed board. 17. To 12 on main printed board.

* *This pin should be connected to the braiding of the screened connecting lead. There should be no connection between the braid and the metal sleeve of the plug.*



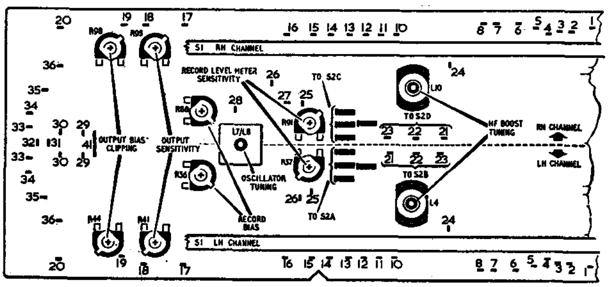
(H77) Component Locations—H.M.V. Model 2236C

MARCONIPHONE Model 4218

General Description: Four-track, three-speed stereo tape recorder with Thorn type DC432 tape deck, which is described in this volume. T.P.I.: four-digit counter (button reset). Audio output: 5 W each channel. Power supply: 230–250 V, 50 Hz, A.C. only. Power consumption: 45 W. Monitoring: input signals through internal or extension loudspeakers stereophonically or in parallel (mono). Track transfer switch: playback of one track mixed with new recording on second track (mono only), both channels can be monitored. Socket extension loudspeaker: 2 × 8 Ω at 5 W (switched sockets to disconnect internal loudspeakers). Socket radio in/out: input 0·25 mV into 4·7k (left-hand pin 1, right-hand pin 4), left- and right-hand channels connected together when stereo/mono switch is set to mono, output 500 mV at 10k (left-hand pin 3, right-hand pin 5), left- and right-hand channels connected together when stereo/mono switch is set to mono. Socket PU input: 50 mV into 1 M (left-hand pin 3, right-hand pins 1 and 5), left- and right-hand channels connected together when stereo/mono switch is set to mono. Socket gram input: 100 mV into 100k (left-hand pins 3 and 4, right-hand pins 1 and 5), left- and right-hand channels connected together when stereo/mono switch is set to mono. Socket remote: pin 5 and the plug shield are used for remote pause switching.

Removing Tape Deck Top Cover: Pull off amplifier control knobs and speed change knob. Take out screw securing head cover and then six screws securing top cover to deck (four cross-headed, two slot-headed). The top cover can now be tilted at the rear edge and eased forward to lift clear.

Removing Deck From Cabinet: Take out four screws around edge of deck top plate. The deck and amplifiers can now be lifted clear of cabinet within limits of loudspeakers connecting leads. To free unit completely, pull off tag connections to loudspeakers noting colour coding for reassembly.

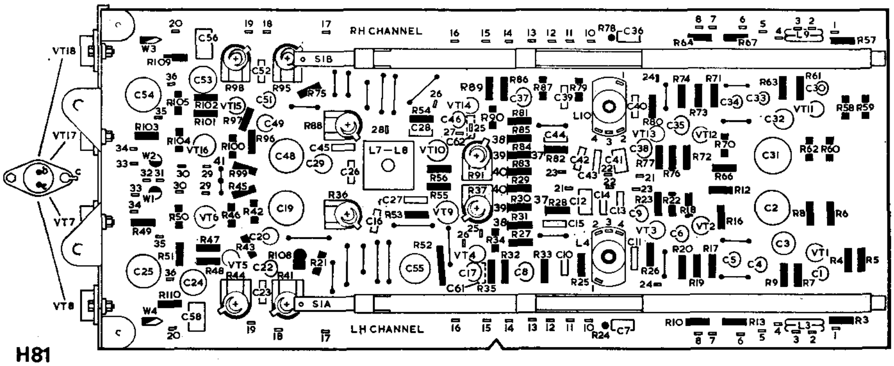


H78

(H78) Tags on Printed Board—Model 4218

Access to Printed Board: Most meter checks and some component replacement may be carried out with the printed board in position. For complete

access, the chassis should be placed on its rear edge and the printed board metal cover removed (four screws). Detach circlips and PTFE washers from studs on the two record switch links. Release screws and washers from right-hand corners of printed board and also three screws securing heat sink bracket to main chassis. The board may now be hinged out to expose the component side.



H81

(H81) COMPONENT LOCATIONS—MODEL 4218

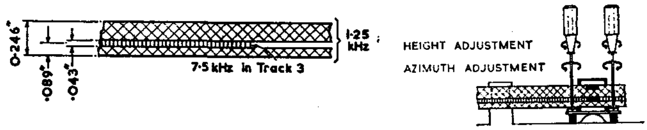
Removing Printed Boards: When handling chassis take care to avoid breaking counter reset button. Hinge out printed board as described in previous paragraph. All printed board tags except 27, 28, 31 and 32 are duplicated for left- and right-hand channels as shown in the accompanying diagram (H78).

The suffix L or R against lead colours indicates the channel. Where screened leads are involved the second tag number indicates the outer connection—the only exception to this is mentioned. Unsolder the following external leads from the printed board:

1. White (L) and mauve (R) microphone leads from tags 1 and 2.
2. Blue (L) and red (R) record/play head leads from tags 3 and 4 (3 is outer).
3. Yellow (L) and white (R) microphone/radio control leads from tags 5.
4. Brown (L) and orange (R) gram control leads from tags 6 and 8.
5. Green (L) and blue (R) microphone/radio control leads from tags 7 and 8.
6. Orange (L) and white (R) S3B and S4A leads from tags 10 and 12.
7. Red (L) and brown (R) S3A and S4B leads from tags 11 and 12.
8. Yellow (L) and mauve (R) S3A and S4B leads from tags 13 and 14.
9. Red (L) and orange (R) S3B and S4A leads from tags 15.
10. Red (L) and orange (R) erase head leads from tags 16.
11. Mauve (L) and red (R) tone control leads from tags 18 and 19.
12. White (L) and orange (R) stop and pause solenoid leads from tags 20.
13. Blue and red (L) and blue and yellow (R) meter leads from tags 25 and 26.
14. Green (L) and orange (R) LS socket leads from tags 34.
15. Release also the following (tag connections are single):
16. Blue S3B lead from tag 28.

17. Grey and black leads from tag 31.
18. Brown lead from tag 32.
19. Red C60 lead from tag 41.
20. Speed compensation switch wafer from deck.

Demagnetisation: It is important that there is no residual magnetism in the heads or the capstan spindle. This condition, which may arise if magnetised objects are brought near these components, or if an ohmmeter is connected to the head windings, will lead to an increase in background noise on playback. Suitable instruments for providing a demagnetising field are available from a number of manufacturers.



H79

(H79) Head Adjustments—Model 4218

Head Adjustment: Provision is made on the head mounting for both vertical (height) and horizontal (azimuth) adjustment. Adjustment only becomes necessary when the manufacturing settings have been disturbed.

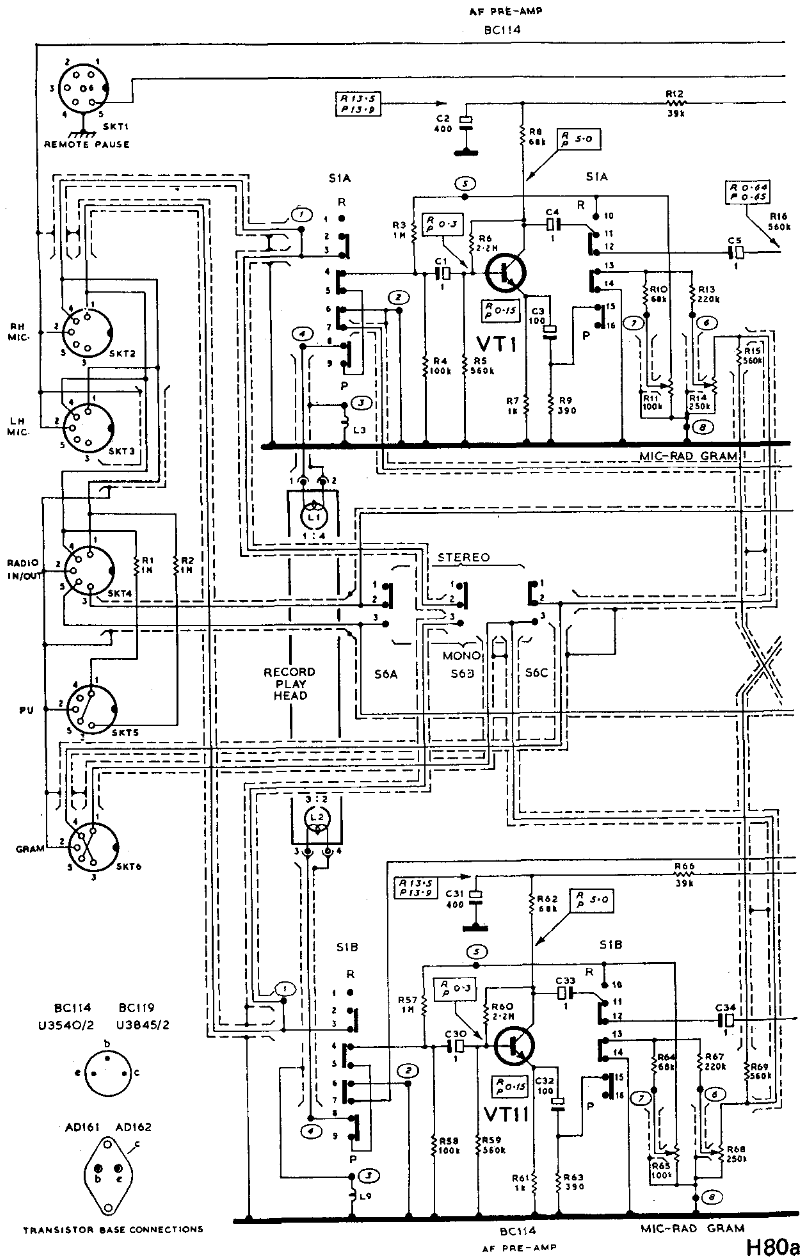
Special Test Tape: The Thorn Height and Azimuth Test Tape Type 6 may be purchased direct from the manufacturers, Messrs Tutchings Electronics Ltd, 14 Rookhill Road, Frias Cliff, Christchurch, Hampshire.

Azimuth and Height Adjustment: Use special test tape type 6. The method of adjustment requires simultaneous indication for both which is achieved by reading from track 3. Azimuth is correct when the 7·5 kHz tone is at maximum and height when the 1·25 kHz tone is at minimum. Height is adjusted by turning both screws in the same direction and azimuth by turning in opposite directions, as shown in diagram H79. Use the loudspeaker to find the minima of the 1·25 kHz tone but, because maxima are difficult to recognise aurally, use a meter to determine the peaks of 7·5 kHz tone.

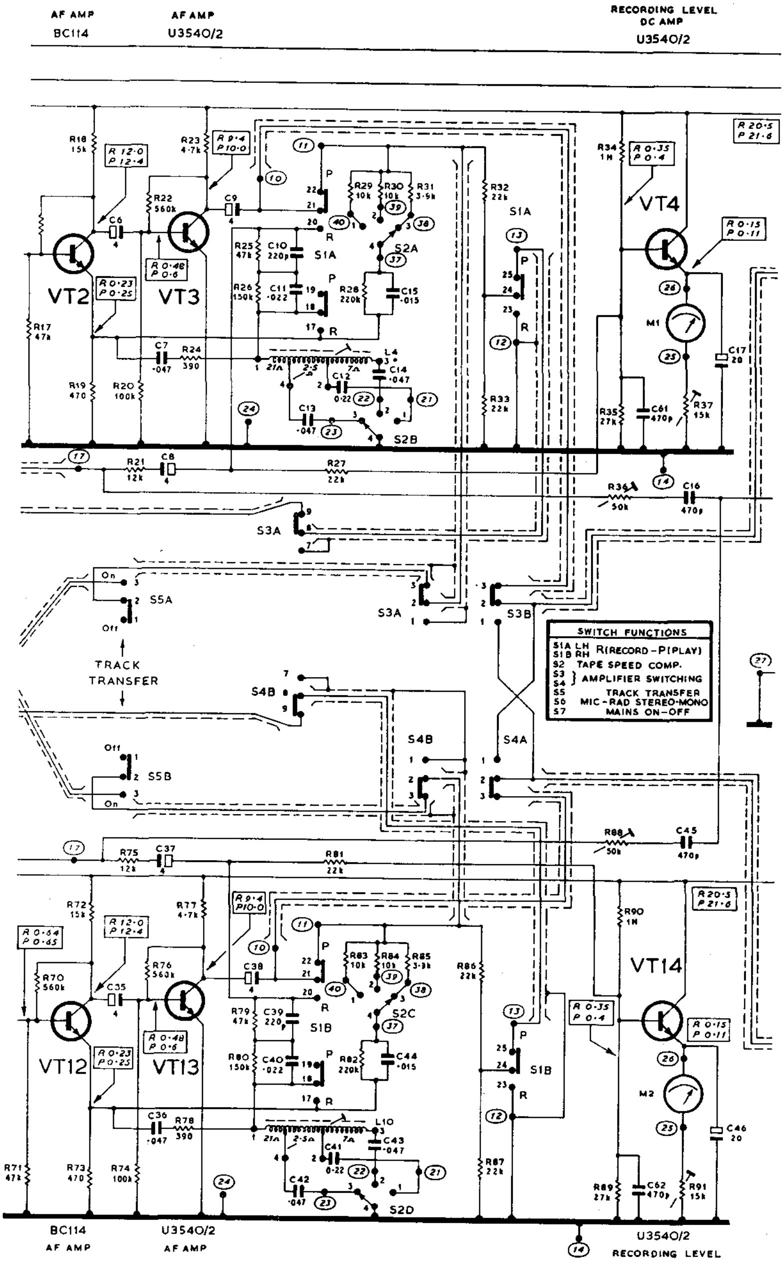
Erase Head: The erase head is accurately located by two rails and a pip moulded into the erase head mount. No adjustment is provided.

Circuit Diagram Notes

1. Voltage measurements shown in rectangles were taken relative to negative chassis line of each transistor (except where otherwise indicated) under quiescent conditions, with a 20,000 ohm/volt meter set to the 100 V D.C. range and with a mains input of 245 V. D.C. resistance readings are shown against inductors where these are 1 Ω or greater. Ringed figures indicate printed board tag connection points.
2. In some recorders C55 is 100 μF and C61 and C62 are not fitted.
3. In early production, pins 1 and 4 of SKT5 and pins 1 and 4 of SKT6 are used for left- and right-hand channels respectively.

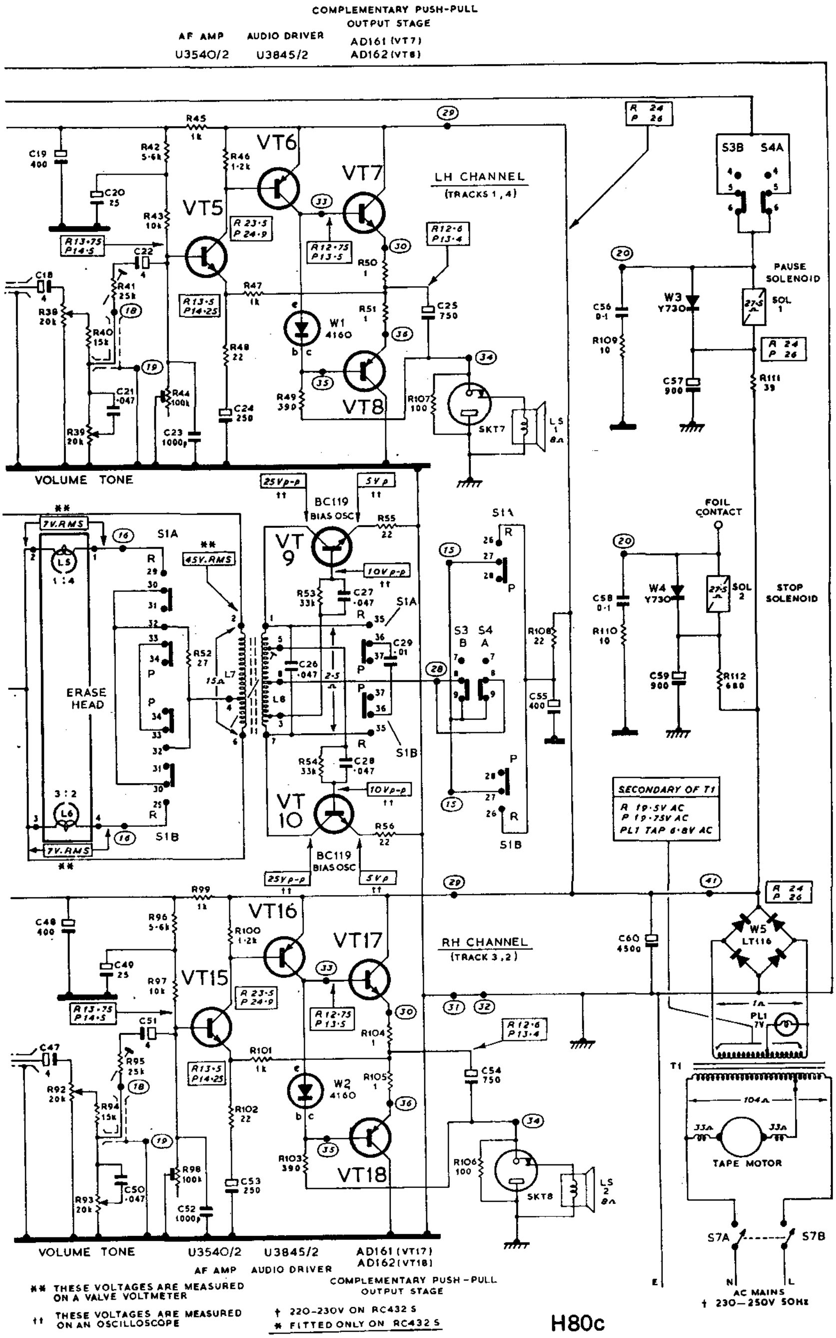


(H8oa, b and c) THIS, AND THE SUBSEQUENT TWO PAGES: CIRCUIT DIAGRAM—MODEL 4218



H80b

Circuit is shown switched for STEREO PLAY operation


COMPLEMENTARY PUSH-PULL OUTPUT STAGE
AF AMP U3540/2
AUDIO DRIVER U3845/2
AD161 (VT7) AD162 (VT8)
LH CHANNEL (TRACKS 1, 4)
RH CHANNEL (TRACK 3, 2)
VT5 VT6 VT7 VT8
VT15 VT16 VT17 VT18
BC119 BIAS OSC
ERASE HEAD
PAUSE SOLENOID
STOP SOLENOID
FOIL CONTACT
SECONDARY OF T1
R 19·5V AC
P 19·75V AC
PL1 TAP 6·8V AC
TAPE MOTOR
VOLUME TONE
AC MAINS
† 230—250V 50Hz
** THESE VOLTAGES ARE MEASURED ON A VALVE VOLTMETER
†† THESE VOLTAGES ARE MEASURED ON AN OSCILLOSCOPE
† 220-230V ON RC432 S
* FITTED ONLY ON RC432 S

H80c

4. If the record/play head push-on clips are disconnected for any reason, it is most important that these are reconnected as shown in the circuit diagram, otherwise the input signals will be incorrectly channelled for stereo recording and playback. Similar reasoning applies to the erase head should the contacts be incorrectly wired.

Power Supplies: The mains transformer is connected to a 230/250V A.C. mains supply, with the tape recorder motor connected to a tapping on the primary side. The secondary winding is connected to a bridge rectifier that supplies a D.C. voltage to operate the recorder sections and main amplifiers. It also supplies power to operate the pause and stop solenoids and is taken out to the remote pause socket (SKT1) for external use. The solenoids (SOL1 and SOL2) are operated by the discharge of the reservoir capacitors which give a high initial energising current. The pause solenoid is subsequently "held on" by the current through feed resistor R111.

Playback: The correct head (L1 or L2) winding is selected by left/right play keys operating in conjunction with S1A/S1B. Contacts 8 and 9 of S1A/S1B switch the playback head output voltages to the bases of VT1/VT11, the other side of the head windings being returned to chassis via the screening braid and L3/L9. The amplified signal at the collector of VT1/VT11 is fed via C4/C33, S1A/S1B contacts 11 and 12 and C5/C34 to the base of VT2/VT12 which with VT3/VT13 provide two further stages of amplification. A frequency selective feedback circuit, switched by S2A/S2C contacts 1–4 from VT3/VT13 collector to VT2/VT12 emitter give bass boost playback equalisation. VT3/VT13 output is fed to the radio output socket (SKT4) pins 3 and 5 via S1A/S1B contacts 21 and 22, R32/R86, S1A/S1B contacts 24 and 25 and S3A contact 8 and 9, S4B contacts 8 and 9 and S6A contacts 2 and 3. Signals at the collector of VT3/VT13 are fed via C9/C38 to the left- and right-hand channel amplifiers respectively through S3B contacts 2 and 3 and S4B contacts 2 and 3.

The left-hand channel output appearing at the collector of VT3 can be switched to the right-hand channel amplifier by S3B contacts 1 and 2 and the right-hand channel output at VT13 can be switched by S4A contacts 1 and 2 to the left-hand channel amplifier. This permits playback of one track mixed with a new recording on a second track via S5A/S5B (track transfer switch). Volume and tone control to the main left- and right-hand channel amplifiers is provided by R38/R92 and R39/R93 respectively. Negative feedback is provided by R48 for the left-hand channel and R102 for the right-hand channel.

Record: The input sockets SKT2, SKT3, SKT4 pins 1 and 4 and SKT5 are switched by S1A/S1B contacts 3 and 4 to the pre-amplifier stages VT1/VT11. The output of VT1/VT11 is fed via C4/C33 to S1A/S1B contacts 11 and 10, R10/R64, microphone/radio control (R11/R65) and C5/C34 to VT2/VT12. Treble boost record equalisation is provided by a frequency selective feedback circuit connected between VT3/VT13 collectors and VT2/VT12 emitters via S1A/S1B contacts 21 and 20 and 18 and 17. High note correction is provided by L4/L10 in conjunction with capacitors C12/C41, C13/C42 and C14/C43 switched into circuit by S2B/S2D contacts 1–4. VT3/VT13 output is fed via C9/C38, S1A/S1B contacts 20 and 21, C8/C37, R21/R75 and S1A/

S1B contacts 7 and 8. The head windings are returned to chassis via the screening braid and L3/L9. Part of the signal developed at the collector of VT3/VT13 is fed to the base of VT4/VT14, the record level indicator rectifier and D.C. amplifier. Transistor metering circuits are employed to eliminate the differential loading imposed by the level meters on the third stage of the amplifiers.

Power for erasing and recording bias is supplied by VT9/VT10 connected as a push-pull oscillator when the instrument is switched to record. The oscillator is tuned to approximately 55 kHz and erase power is fed to the erase heads from a tapping on L7 via S1A/S1B contacts 30 and 29. In order to limit the power fed to the erase head, R52 the oscillator level compensation resistor, is switched in series with the erase head in use when record is selected for one channel only. The resistor is switched out of circuit when both heads are in use on stereo record.

Playthrough Amplifier: With the recorder switched to record the signals from SKT2, SKT3 and SKT4 are connected to VT1/VT11 by S1A/S1B contacts 3 and 4. The microphone/radio control (R11/R65) adjusts the desired level of signal to be fed to VT2/VT12. The gram socket (SKT6) feeds VT2/VT12 via R14/R68, R13/R67 and S1A/S1B contacts 13 and 12. R14/R68 controls the mixing level to the amplifiers and as the record level meters are operational these can be used to predetermine the desired level from each socket as required.

Production Preset Adjustments: 1. Replacement of C14/C43 will necessitate adjustment of L4/L10. 2. R36/R88 will need readjustment if C16/C45 or record/play head is replaced. 3. R37/R91 will need to be reset if transistor VT4/VT14 or a record level meter M1/M2 is replaced. 4. The tuning of oscillator coil L7–L8 (55 kHz) should be checked and, if necessary, retuned after a replacement erase head is fitted, also if C26 or C29 have been replaced.

Record Equalisation Adjustments L4/L10: Hold down "record" keys, set speed change knob to $3\frac{3}{4}$ in/sec. Inject 15 kHz signal from an audio oscillator into any input socket, and adjust core of L4/L10 for maximum output as indicated on the level meters.

Record Level Meter Calibration Adjustments R37/R91: Insert a close tolerance 100 Ω resistor in series with and directly connected to the "earthy" tag of the record head. Connect a valve-millivoltmeter across the resistor. Inject a 1 kHz signal from an audio oscillator into any input socket. Hold down the appropriate "record" key and adjust the signal input level to obtain a head current of 90 μA, i.e. a reading of 9 mV across the 100 Ω resistor. This represents peak recording level, and preset resistor R37 or R91 should be adjusted so that the appropriate level meter registers at the junction of the red and black sections of the scale.

Bias Level Adjustments R36/R88: Insert a close tolerance 100 Ω resistor in series with, and directly connected to, the "earthy" tag of the record head and connect a valve-millivoltmeter across this resistor. R36/R88 should be set initially to give a bias current of 550 μA, i.e. 55 mV across the 100 Ω resistor.

At a level 20 dB below peak recording level, make a frequency response recording at $3\frac{3}{4}$ in/sec. Switch to playback and check that the frequency

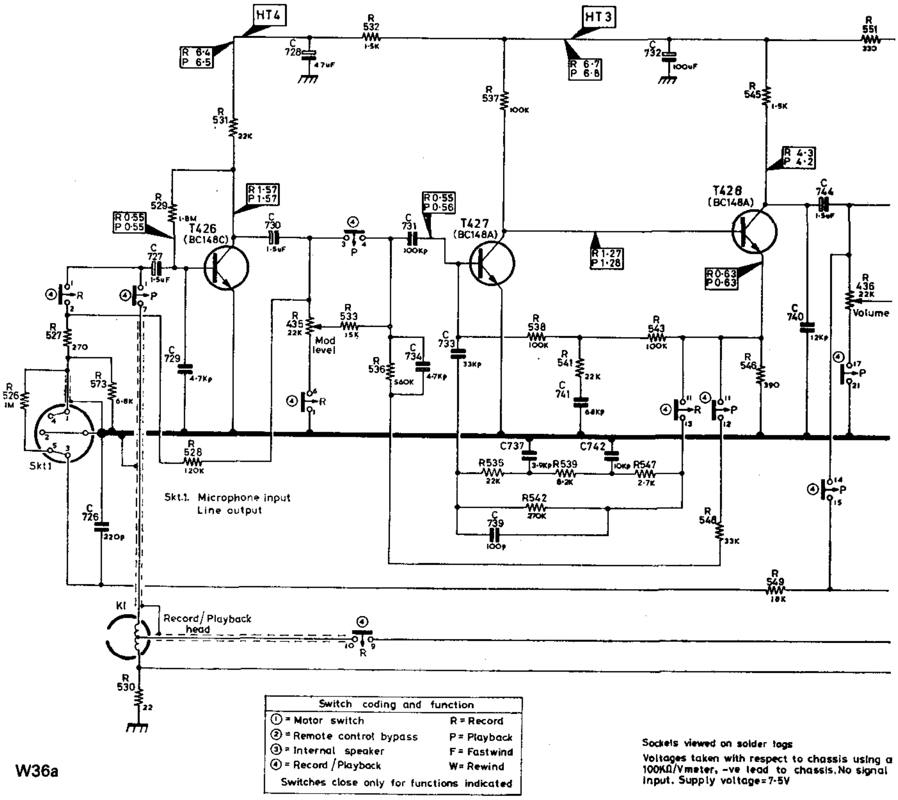
response at 14 kHz is within ± 3 dB with reference to the level at 1 kHz. If the result is not within ± 3 dB, R36/R88 must be readjusted. If the response is too high, readjust R36/R88 to increase bias: if too low, readjust to reduce bias. If in order to obtain a frequency response level within ± 3 dB it is necessary to adjust the bias current to a value outside the limits 450–650 μA, i.e. 45–65 mV across the 100 Ω resistor, then it must be assumed that either the record/play head is faulty or that a fault exists which affects the normal frequency response of the record amplifier, such as misalignment of L4/L10. In any case, the fault must be corrected before attempting to readjust R36/R88.

MARCONIPHONE Model 4238

General Description: This model is electrically similar to the Ferguson model 3238, which is fully described earlier in this volume.

PHILIPS — Model EL3302A/15G

General Description: A portable, battery operated, cassette tape recorder supplied with a microphone with remote control unit, a connecting lead and pre-recorded demonstration tape cassette. Battery supply: $5 \times 1\frac{1}{2}$V (U11 or equivalent).

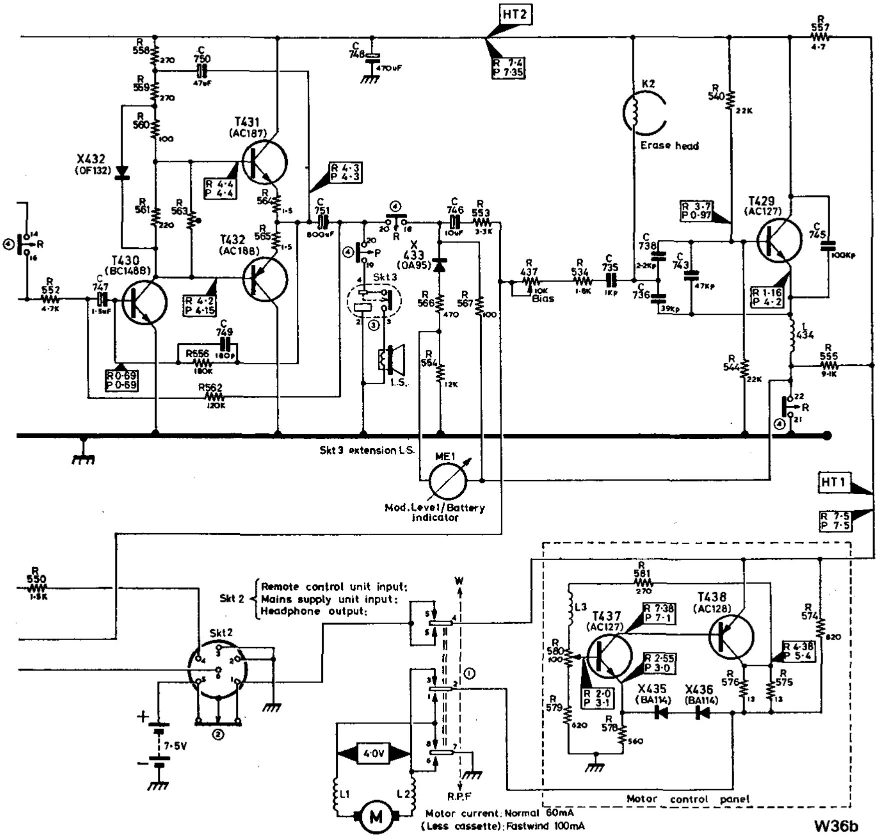


(W36a) Circuit Diagram—Model 3302A/15G (Part)

Adjustment of R437 (Recording Bias Current): This current may be measured by measuring the voltage drop across R530, which should lie within the limits 10–25 mV. To adjust: switch to record, set the modulation control to minimum and connect an A.C. millivoltmeter between pins 6 and 2 (chassis)

of SKT2. Adjust R437 to obtain the correct voltage. The voltage across the erase head (K2) should be approximately 16V.

Note: In some sets R557 is omitted and replaced by a shorting link. Also, in some sets R555 is 220Ω.



(W36b) Circuit Diagram—Model 3302A/15G (Continued)

PHILIPS Model EL3302A/15

General Description: This machine is electrically similar to the Philips model EL3303A/15 (following), except for the supply, which is derived from 5 × 1½V cells (U11). All the circuit voltages are proportionately lower than those indicated in the EL3303A/15 circuit diagram.

PHILIPS Model EL3303A/15

General Description: Portable twin-track battery operated tape recorder featuring the Philips compact cassette system. Accessories supplied include a moving coil "stick" type microphone with detachable remote stop/start control, a direct record/play lead and a C60 tape cassette. Store space is provided for the microphone in the base of the cabinet.

Sockets:

SKT1: Microphone input: 0·3 mV to pins 1/4 and 2 across 2 kΩ. Radio/PU input: 225 mV to pins 1/4 and 2 via a 1·5 mΩ resistor (incorporated in EL3768/03 connecting lead). Line output: 0.5 V output across 20 kΩ from pins 3/5 and 2.

SKT2: Remote stop/start control: pins 5 and 1/2. External mains supply unit: pins 3 and 1/2. Monitoring output (ST474 and EL3303 only): 200 mV across 1·5 kΩ from pins 4 and 1/2.

SKT3: Extention loudspeaker: 8 Ω impedance.

Removing the Cabinet Base: Remove the batteries and storage compartment cover. Release the five screws securing the base to the cabinet, then lift the base clear and, if necessary, disconnect the two leads from the battery compartment.

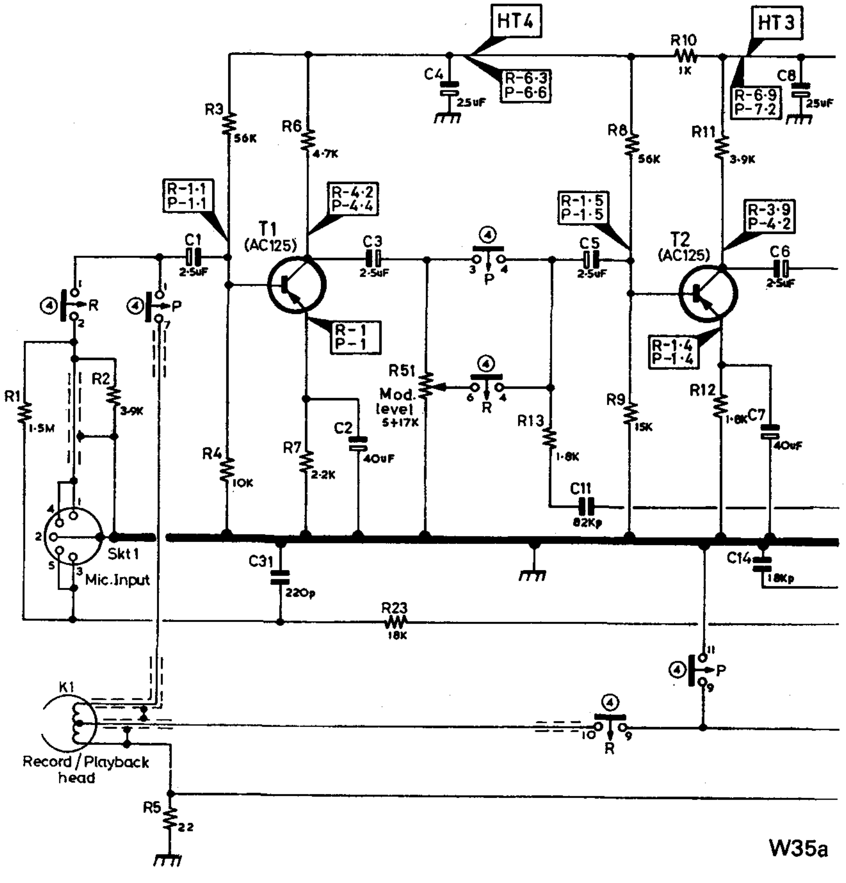
Chassis Removal: Remove the cabinet base as described above. Remove the countersunk screw from the centre of the cassette compartment, and pull off tape transport knob (make sure that the recorder is switched to the off position). Withdraw the 3 mm screw from the corner of the chassis adjacent to the motor control panel, and remove the spring clip from the modulation meter. Pull off the three control knobs and lift out the control panel from the "level" control end. The chassis together with the moulded socket panel, control panel and the meter, may then be removed. Reassemble in the reverse order.

Printed Panel Removal (Amplifier): Remove the small screw from the tape transport end of the panel, and the screw securing the output transistors mounting bracket to the chassis. Release the support bracket from the edge of the panel and disconnect the leads. Reassemble in the reverse order taking care that switch lever engages the slider of S4.

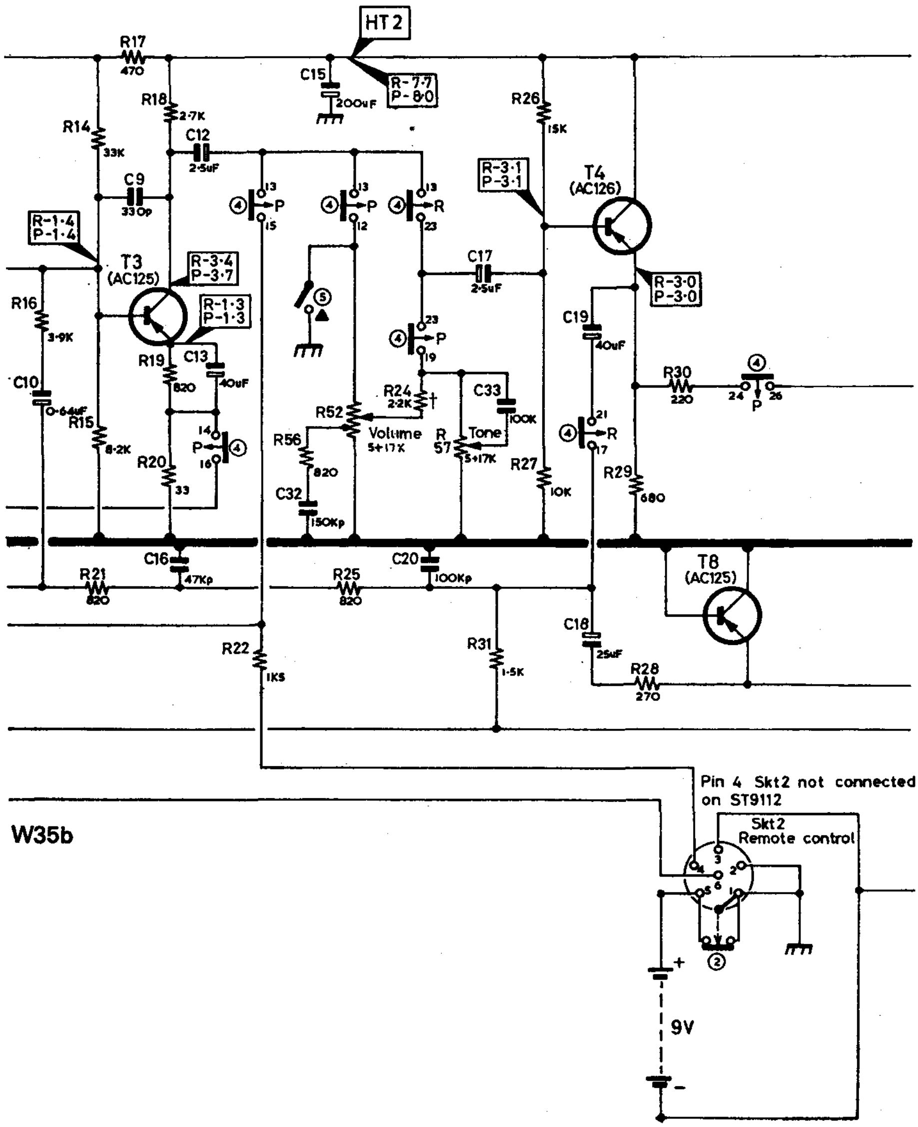
Motor Control Panel Removal: Remove the chassis as described above. Disconnect the three leads from the control panel, and remove the screw which secures the panel mounting bracket to the chassis. After servicing or replacing the panel the speed must be checked and, if necessary, adjusted with R54.

Motor Speed Adjustment: To carry out this adjustment, one side of a standard cassette must be removed. This is best done with the aid of a small knife, the burrs being removed with a file. The tape speed is checked by pulling a loop of tape from the side of the cassette and holding inside this loop a suitable tape stroboscope. Using a set of good batteries, adjust R54 to obtain the correct speed as indicated by the stroboscope when viewed under a 50 Hz light source.

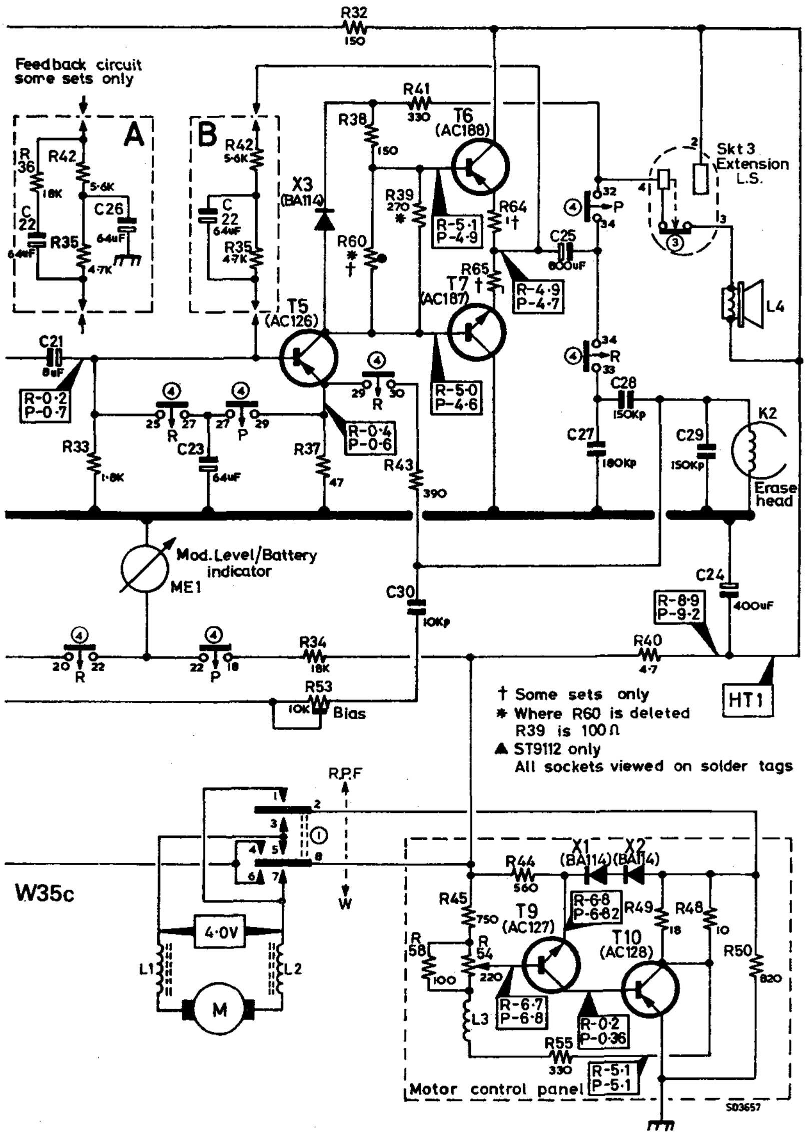
Record Bias Adjustment: In the "record" position, with the modulation level control at minimum, an A.C. voltage of 10–25 mV (on V.V.M.), should be measured between pins 6 and 2 of SKT2. Adjustment is made by means of R53 on the main printed panel.



(W35a) Circuit Diagram—Model EL3303A/15 (Part)



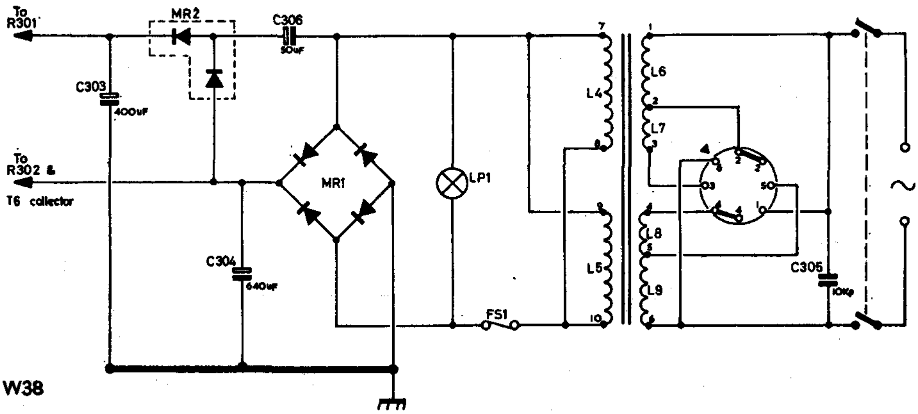
(W35b) Circuit Diagram—Model EL3303A/15 (Part)



(W35c) Circuit Diagram—Model EL3303A/15 (Continued)

PHILIPS Model EL3310A/15D

General Description: A mains operated, two-track cassette tape recorder employing automatic recording level control. Piano key push-button controls are incorporated and an adjustable sound reflector is fitted above the loudspeaker. In machines prior to marking WRO4, 52/66 an alternative recording level control circuit is used as shown in circuits W and Z on the main circuit diagram. In EL3310A machines marked WRO5 1/68 onwards, a new power supply circuit is used as shown.



(W38) Power Supply Circuit for Machines Marked WRo5 1/68 Onwards—Model EL3310A/15D

H.F. Erase and Bias Oscillator: With the "record" and "play" keys depressed, the oscillator voltage, measured across the erase head, should be between 13 and 18 V A.C.

Recording Bias Adjustment (L2): Check that the oscillator voltage across the erase head is correct. Connect an A.C. millivoltmeter to the measuring point (pin 6, SKT1) and depress the "record" and "play" keys. Adjust the core of L2 by sliding it in or out, to give a meter reading of approximately 32 mV.

T5 and T6 Collector Current Adjustment (R49): Depress the "play" key, turn the volume control to minimum and adjust R49 so that the voltage at the junction of R47 and R48 is exactly half the H.T. voltage at the collector of T6. This should give a quiescent current of approximately 6 mA in the output stage.

Cabinet Removal: Pull off the volume and tone control knobs and withdraw the four screws in the base of the cabinet. The top section of the case may now be lifted sufficiently to enable the modulation meter to be unclipped from its aperture. The top section can now be withdrawn to the extent of the loudspeaker leads. To remove the chassis and amplifier, withdraw the four screws at the corners of the chassis, unscrew two screws securing the volume and tone control

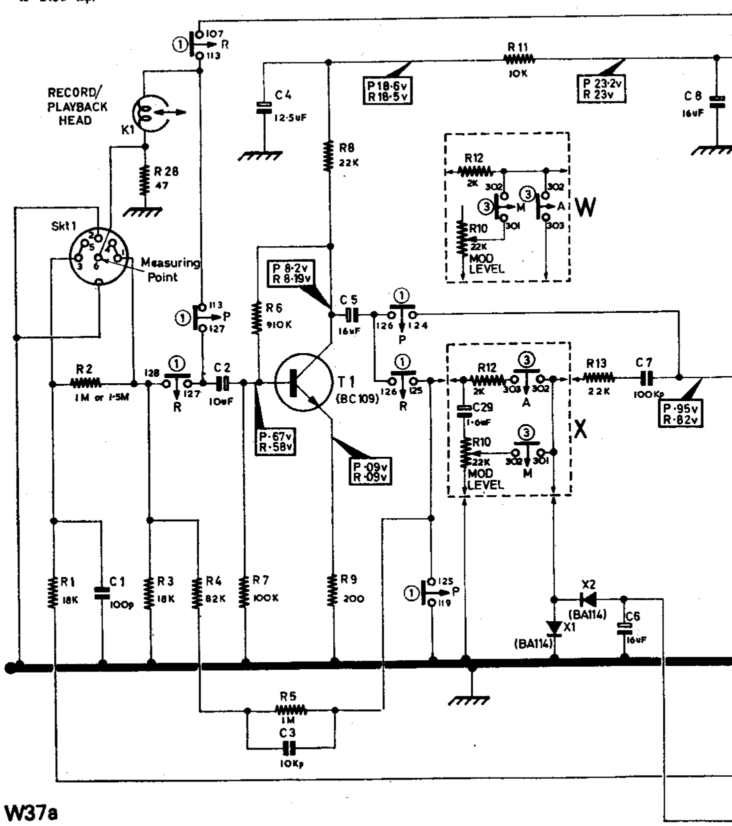
NOTE:- In some EL3310 machines circuits W and Z are substituted for X and Y respectively.

All voltages taken, unless otherwise stated, with respect to chassis using a 100kΩ/V. meter. Mains input 240V.a.c. to 245V. tap.

SWITCH NO.	FUNCTION
1	Record / Playback
2	Play (R.P.) Stop
3	Automatic / Manual

SWITCH CODING		
R	=	Record
P	=	Playback
R.P.	=	Record and Playback
STOP	=	All keys up
A	=	Automatic
M	=	Manual

Switches close only for functions indicated.

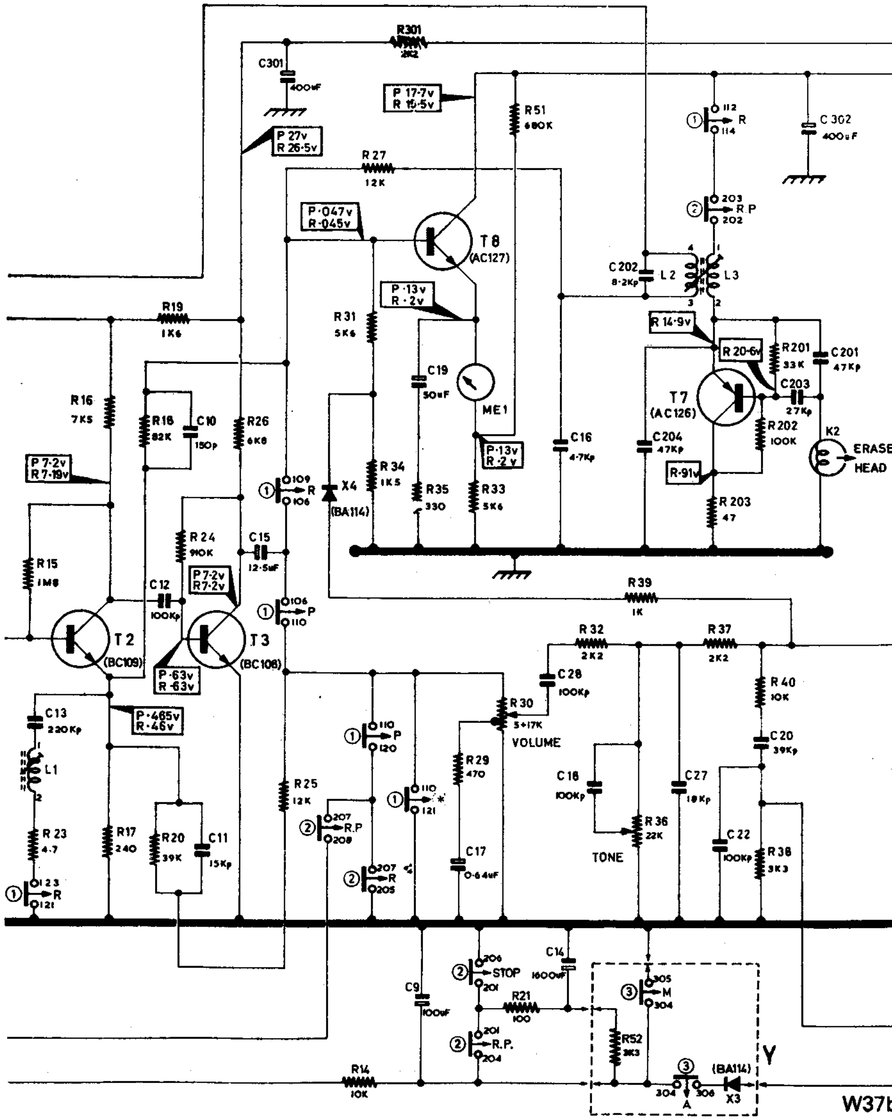


W37a

(W37a) Circuit Diagram—Model EL3310A/15D (Part)

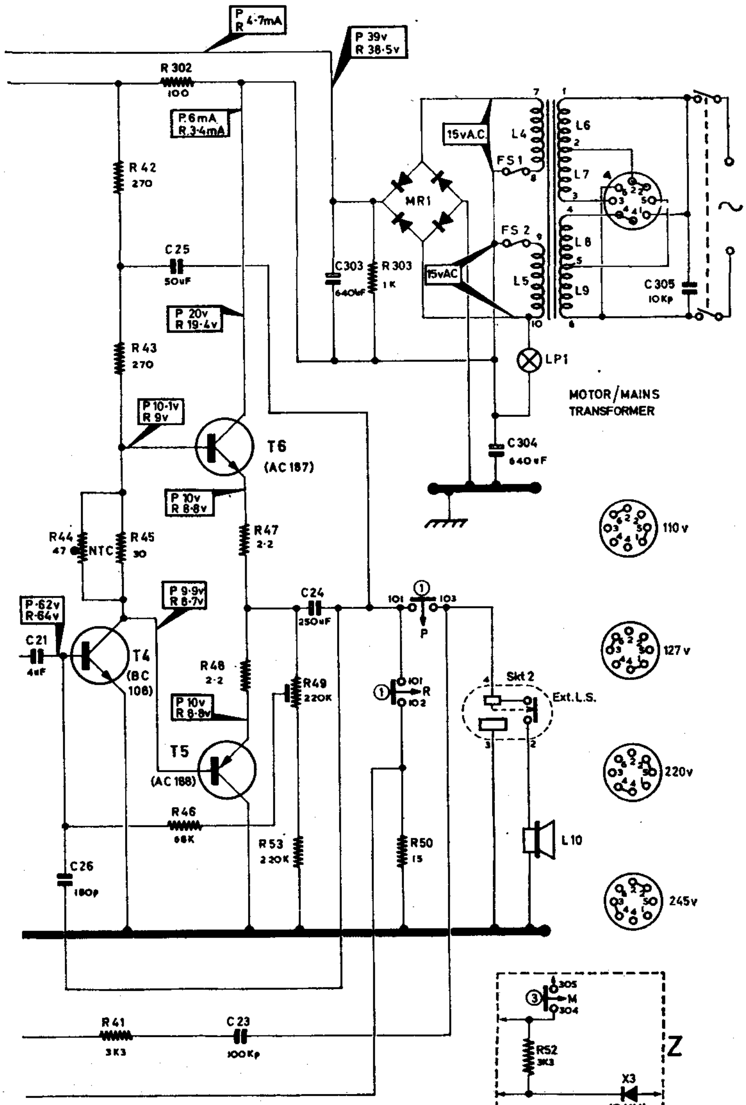
bracket and remove lead compartment cover by withdrawing its two fixing screws. The complete chassis assembly may now be withdrawn. Re-assembly is carried out in the reverse order.

Amplifier Panel Removal: To facilitate work on the main printed panel, it may be detached from the chassis by loosening two screws at the lower edge



(W37b) CIRCUIT DIAGRAM—MODEL EL3310A/15D (PART)

of the output transistor heat sink and two screws below sockets SKT1 and SKT2. Then release the panel, heat sink and socket assembly from the fixing screws and the switch operating levers by sliding it towards the edge of the



W37c

(W37c) Circuit Diagram—Model EL3310A/15D (Continued)

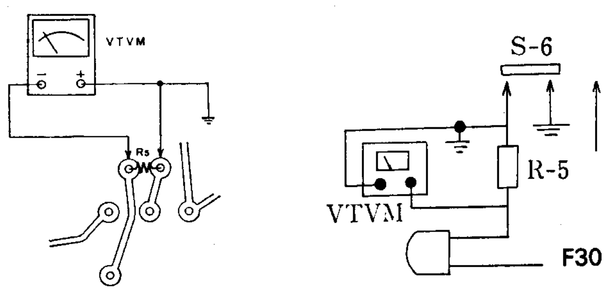
chassis. The panel can now be moved away from the chassis to the extent of the connecting leads. When refitting the panel, ensure that the switch operating levers are correctly engaged with the switch sliders.

SANYO Models M-26 and M-28

General Description: Seven transistor, dual-track, cassette-loading tape recorders with a maximum audio output equal to 500 mW. Frequency response 150 to 6000 Hz between plus and minus 3·5 dB points.

Recording Bias Adjustment: The following adjustments should be made after changing a record/play head, an erasing head, a trap L1 (bias frequency) or the volume control variable resistor (VR3).

1. Supply D.C. 7·5 V to the unit and set it for recording.
2. Connect both terminals of a vacuum tube voltmeter (VTVM) with R5 (10 Ω) resistor in parallel as shown in diagram F30.
3. Adjust L1 so as to fix the trap L1, maximum pointer deflection.
4. Insert the cassette and set the volume knob to 6 (red mark on the panel).
5. Connect an audio generator to the microphone terminal and record two electric signals (600 cycles and 6000 cycles) at 70 dB input.
6. Connect an 8 Ω load resistor with the earphone terminal. Then playback the signal recorded. Turn the volume knob VR3 (100 kΩ) clockwise when the playback signal of 600 cycles is stronger than that of 6000 cycles, counter-clockwise when the 600-cycle signal output power is weaker. Repeat the above adjustment so that the signal output power at 6000 cycles is lower than that at 600 cycles by 2 dB.
7. Follow the steps from 1 to 6 when changing an erasing head, a record/play head or a trap. When changing the VR3, steps 4 to 6 must be followed.

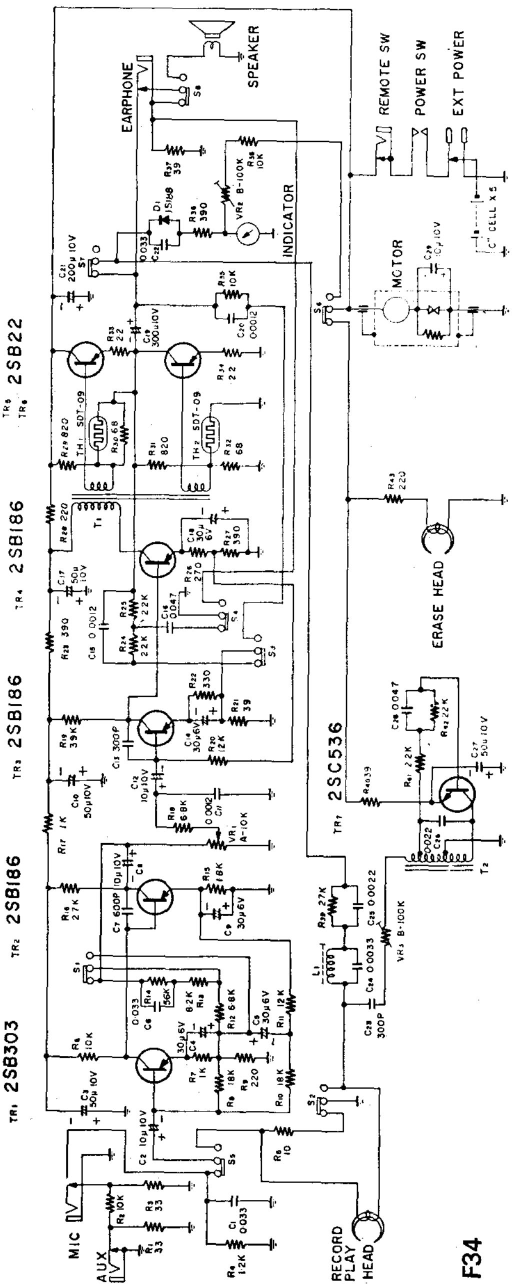


(F30) Recording Bias Adjustment

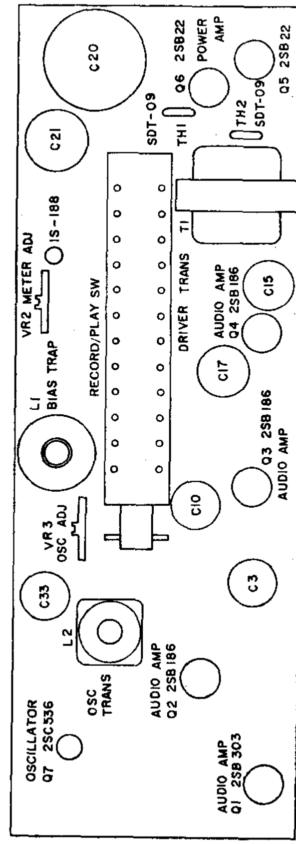
Meter Adjustment: The following adjustment should be made after changing the meter or the volume control variable resistor (VR2B 100 kΩ). Supply 5·5 V D.C. to the unit and set it for playback. Adjust the VR2 (B 100 kΩ) so that the pointer deflects as far as the limit between the red and black zones.

Position of Pinch Roller: The space between the pinch roller stopper and pinch roller arm must be 0·7–1·2 mm when the "play" key is pressed. If not, adjust the angle of the pinch roller stopper by bending it, see diagram F31.

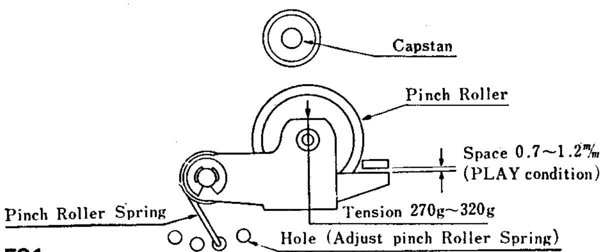
Pressure Exerted by Pinch Roller: When measuring the pressure of the pinch roller as shown in diagram F31, the pressure of the pinch roller should



(F34) Circuit Diagram—Models M-126 and M-128



(F35) Component Locations—Models M-26 and M-28



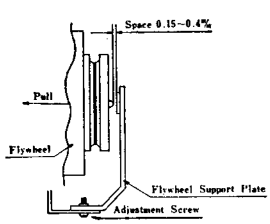
F31

(F31) PINCH ROLLER ADJUSTMENT

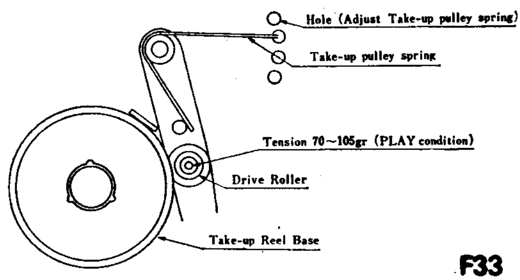
be between 270 and 320 grams. If not, adjustment is possible by resetting the pinch roller spring into another hole.

Adjustment of Flywheel Support Plate: When the space between the flywheel hub and the receptacle on the support plate is either too narrow or too wide, adjust it to 0·15–0·4 mm by turning the screws on the side of the plate, see diagram F32.

Drive Roller Adjustment: Appropriate pressure of the drive roller against the take-up reel should be 70–105 grams when the "play" key is pressed. If not, adjust by resetting the take-up pulley spring into another hole, see diagram F33.



F32



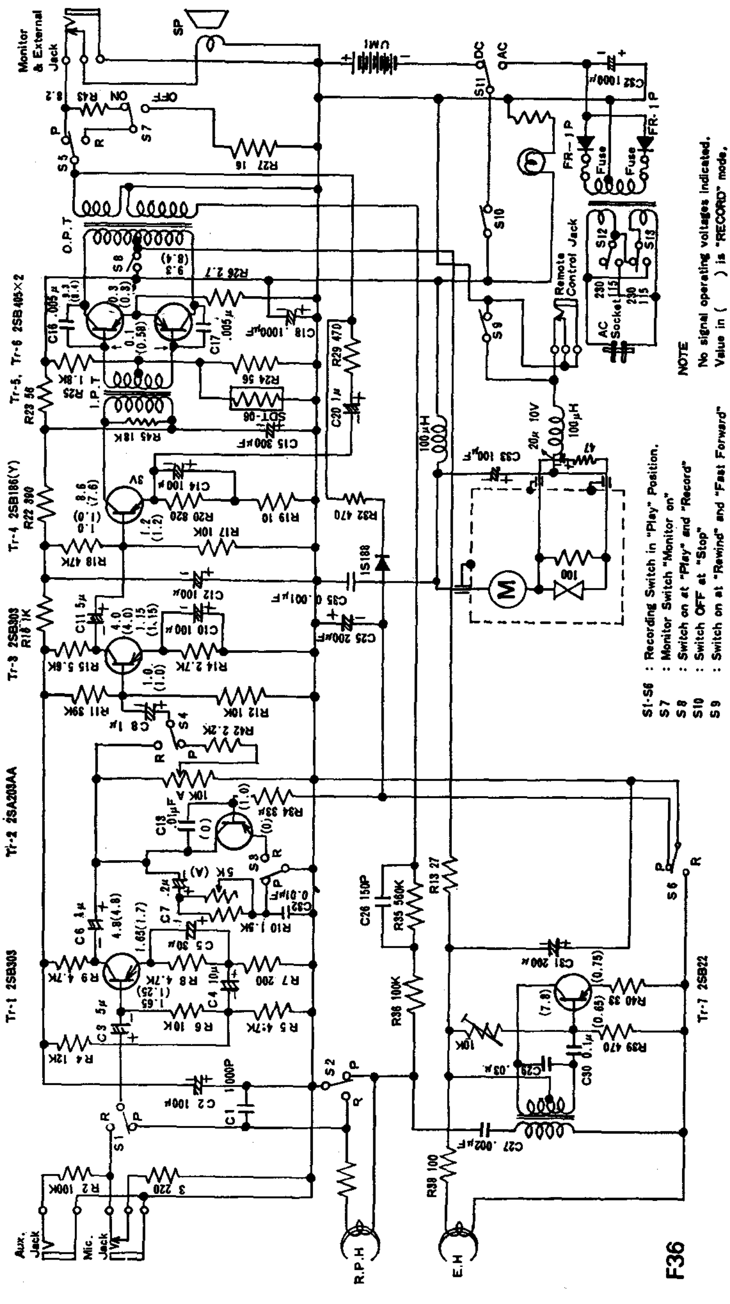
F33

Left: (F32) FLYWHEEL ADJUSTMENT *Right:* (F33) DRIVE ROLLER ADJUSTMENT

SANYO Model MR-115

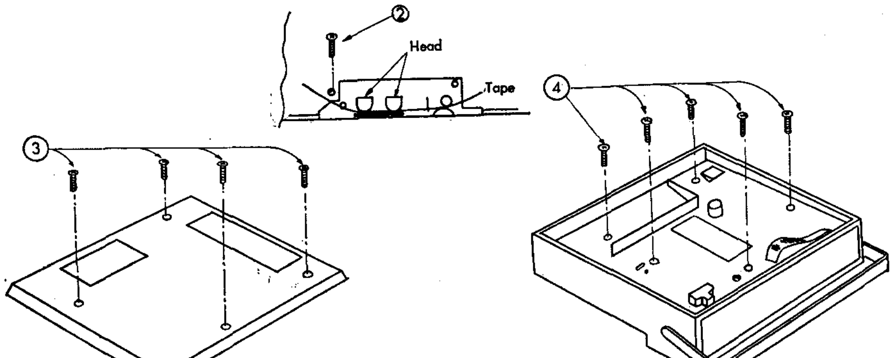
General Description: Seven transistor, dual-track tape recorder. Two speeds, $1\frac{7}{8}$ and $3\frac{3}{4}$ in/sec. Maximum audio output 1·2 W. Frequency response 150 to 6000 Hz at $3\frac{3}{4}$ i.p.s. Power supply 115/230 V A.C. mains or 6 × 1·5 V cells.

Bias Current: This current is adjusted by altering the 10k pot. (in base circuit of Tr7) until 7 mV is measured across the 10-Ω resistor in series with the record head.



(F36) Circuit Diagram—Model MR-115

Dismantling (see diagram F37): 1. Take off the lid, control knob, volume knob, tone control knob and head cover from the set. 2. Remove one Phillips-head screw under the head cover (turn counter-clockwise). 3. Remove the four Phillips-head screws holding the back lid. 4. Remove the five red Phillips-head screws. 5. The amplifier and mechanism can now be taken out of the cabinet except for loudspeaker, volume and tone volume.

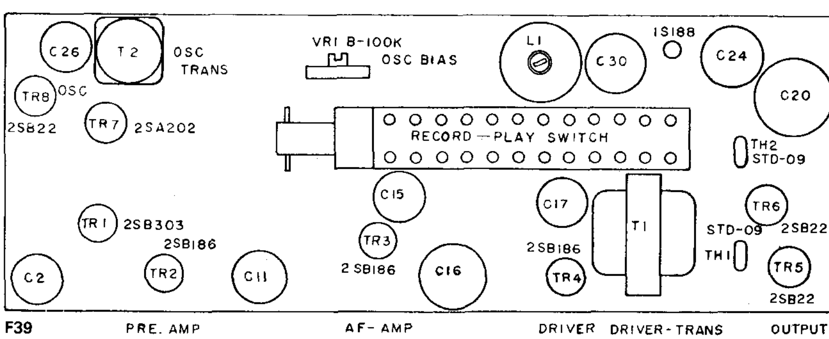


F37

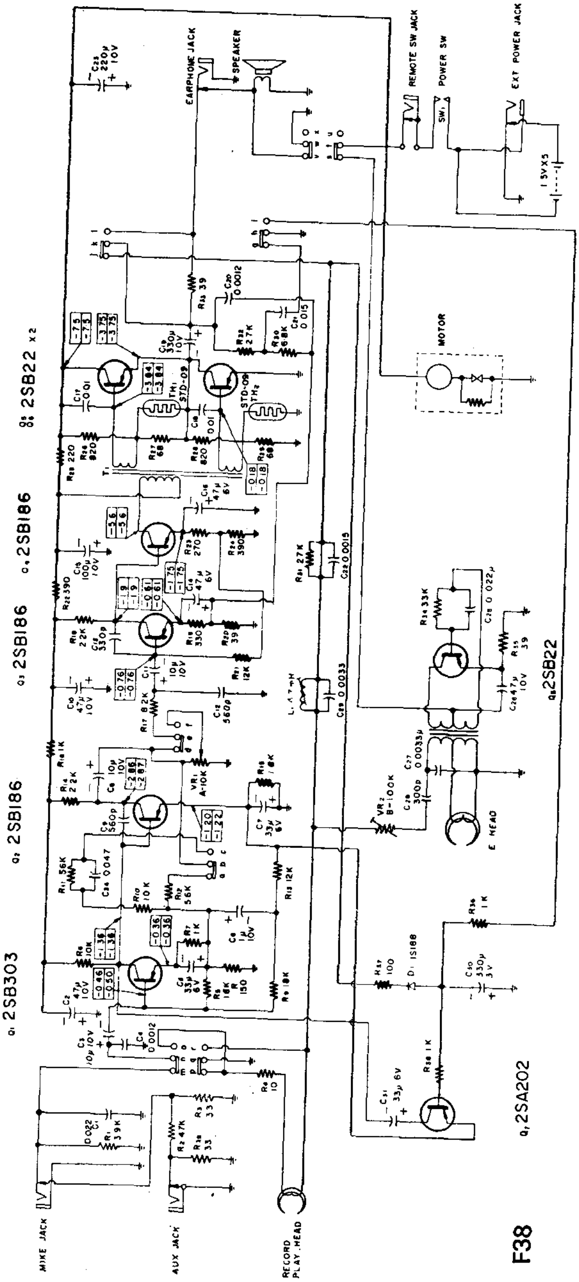
(F37) Dismantling Diagram—Model MR-115

SANYO Model M-138

General Description: Eight transistor, cassette-loading tape recorder. Maximum audio output more than 1 W. Frequency response 100 to 7000 Hz between plus and minus 3·5 dB points.



(F39) Component Locations—Model M-138



F38

(F38) Circuit Diagram—Model M-138

H

STELLA Model ST 473

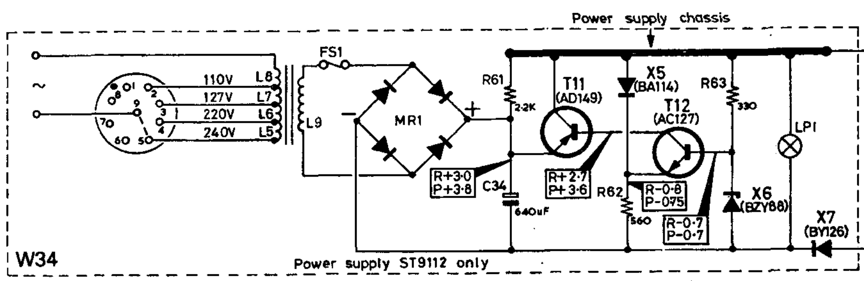
General Description: This machine is electrically similar to the Philips model EL3302A/15, which is described in earlier pages of this volume.

STELLA Model 473G

General Description: This machine is electrically similar to the Philips model 3302A/15G, details of which are given earlier in this volume.

STELLA Models ST474 and ST9112AT

General Description: These models are electrically similar to the Philips model EL3303A/15, which is described elsewhere in this volume. Note that model ST9112AT incorporates a mains supply unit, change over from battery to mains is automatic, a pilot lamp indicating when the mains is connected.



(W34) Power Supply Unit—Stella ST9112AT

STELLA Model ST9111A

General Description: This machine is electrically similar to the Philips model EL3310A/15, details of which are given earlier in this volume.

THORN TAPE DECK DC432

General Description: Four-track, three-speed tape deck. Reel diameter: 7 in (maximum). Tracks: four (can be paired on playback). Tape speeds: 7½, 3¾ and 1⅞ in/sec. Wow and flutter: better than: 0·15 per cent rms at 7½ in/sec, 0·2 per cent rms at 3¾ in/sec and 0·25 per cent rms at 1⅞ in/sec. Tape position indicator: four-digit counter (press-button reset). Motor input: 225 V, 50 Hz A.C. only (117 V, 60 Hz version also available). Power consumption: 28 W (32 W for 60 Hz version). Control interlocks and latches: (*a*) self-latching "pause" key inoperative during spooling, (*b*) "play" key cannot be depressed when spooling in either direction, (*c*) "record" keys are released when any other tape motion key (except "pause") is depressed, and cannot be operated when one or both "play" keys are depressed. Automatic stop: solenoid operated by means of metal foils at ends of tape, functioning on "play", "record", "rewind" and "forward". Remote pause: solenoid operated. Respooling time: 1800 feet in 3 minutes 20 seconds. Magnetic heads: twin ¼-track record/play (stacked) and twin ¼-track erase (stacked).

Cleaning: The use of cleaning fluids such as petrol or carbon-tetrachloride, which might damage plastic surfaces or rubber drives, should be avoided. A soft cloth dampened with methylated spirit should be used to clean the working surfaces of the spool carriers, capstan, pinch wheel, motor pulley and intermediate wheels. Oxide deposits on the magnetic heads and tape guides may be removed in the same manner but objects such as screwdrivers should be kept away from the heads to avoid magnetisation. Pressure pad and clutch pad surfaces should be kept clean and fluffy.

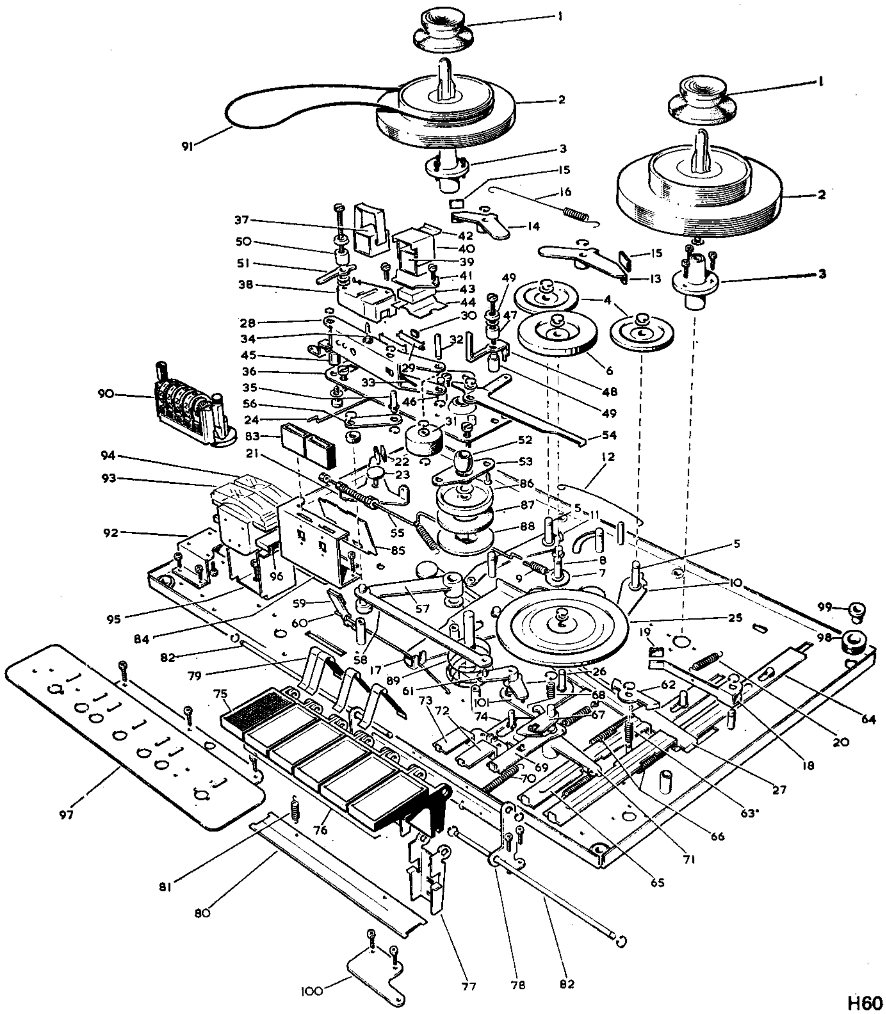
Lubrication: A fine graphite grease should be applied sparingly to the parts listed after dismantling and cleaning, whenever signs of friction between bearing surfaces becomes apparent. 1. Between wheel supports and unit plate. 2. Upper bearing of primary arm shaft. 3. Between take-up wheel support carrying take-up wheel and play rod. 4. Slot in brake lift. 5. Muting switch push rods (on underside of deck). 6. All connecting rod joints. 7. Slot in pinch wheel carrier. 8. Slots in record switch links.

Take care that grease does not get on to the drive surfaces of wheels or the motor pulley. If this happens, the grease must be removed using a cloth dampened with methylated spirit.

Important: Do not lubricate tape position indicator.

Replacement Parts List: When ordering replacement parts, please quote tape deck number and include the description or function given with the part number.

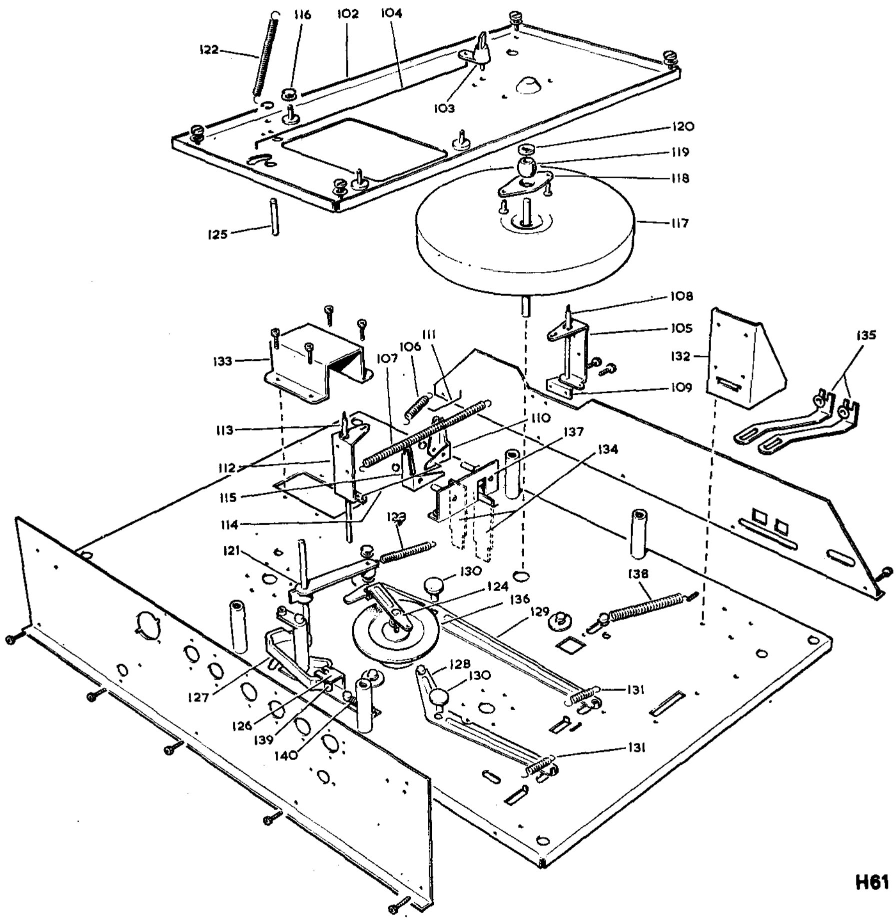
Motor Pulley: In some models the composite motor pulley, part number 8B3–002, is substituted by *two separate* pulleys. 1⅞ and 3¾ in/sec, 50 c/s—part number 8B3–024. 7½ in/sec, 50 c/s—part number 8B3–025.



(H60) Top View of Tape Deck—DC432

Key to parts diagrams

No.	Name	Part No.
1.	Rubber spool clamp	8C8–024
2.	Spool carrier (fibre washer 8L6–001/12; circlip 8L3–008)	8M5–008
3.	Spool carrier bracket assembly (screw SZ04HP05)	8M4–022
4.	Spooling puck wheel grinding assembly (circlip 8L3–016; nylon washer 8L6–001/13)	8M4–014
5.	Spooling wheel spindle (nylon washer 8L6–001/13; nut NFHB06; washer WSPB06; spacer fitted under unit plate 8B3–045)	8B3–018
6.	Spool drum assembly (nylon washer 8L6–001/13; circlip 8L3–016)	8M4–015
7.	Drum support	8B1–068
8.	Spooling wheel spindle (nylon washer 8L6–001/13; nut NFHB06; washer WSPB06; spacing bush fitted under unit plate 8B3–045)	8B3–018
9.	Spool drum bias spring	8B5–034
10.	Wheel spool support—RH	8M1–024
11.	Wheel spool support—LH	8M1–025
12.	Spool wheel bias spring	8B5–021



H61

(H61) Underside View of Tape Deck—DC432

No.	*Name*	*Part No.*
13.	Brake assembly RH—with lining (circlip 8L3–008)	8M1–008/1
14.	Brake assembly LH—with lining (circlip 8L3–008)	8M1–008/2
15.	Brake lining	8B4–003
16.	Brake spring	8B5–056
17.	Brake lift (small circlip 8L3–008; large circlip 8L3–007)	8B1–030
18.	Spooling back tension brake, with lining (circlip 8L3–008)	8M4–021
19.	Brake lining	8F7–004
20.	Back tension brake spring	8B5–058
21.	Pause bell crank	8M4–029
22.	Brake pad	8B4–013
23.	Brake assembly retainer (circlip 8L3–009)	8B3–013
24.	Pause interlock rod	8B5–014
25.	Take-up push wheel grinding assembly (nylon washer 8L6–001/13; circlip 8L3–016)	8M4–016

No.	*Name*	*Part No.*
26.	Spindle (nylon washer 8L6–001/13; nut NFHB06	8B3–018
27.	Brake arm assembly (pivot pin 8B3–037)	8M1–011
28.	Pinch wheel carrier riveting assembly (circlip 8L3–009)	8M1–021
29.	Pressure pad spring	8M1–028
30.	Pressure pad	8F7–005
31.	Pinch wheel grinding assembly	8M4–017
32.	Pinch wheel shaft (circlip 8L3–014; fibre washer 8L6–001/12)	8B3–043
33.	Pinch wheel loading spring	8B5–051
34.	Spring fulcrum pin (circlip 8L3–008)	8B3–068
35.	Pressure pin (circlip 8L3–008)	8B3–065
36.	Head plate riveting assembly	8M1–006
37.	Erase head (clamp spring 8B5–017)	8D5–013
38.	Erase head mount (screw SB06C-C08)	8C5–016

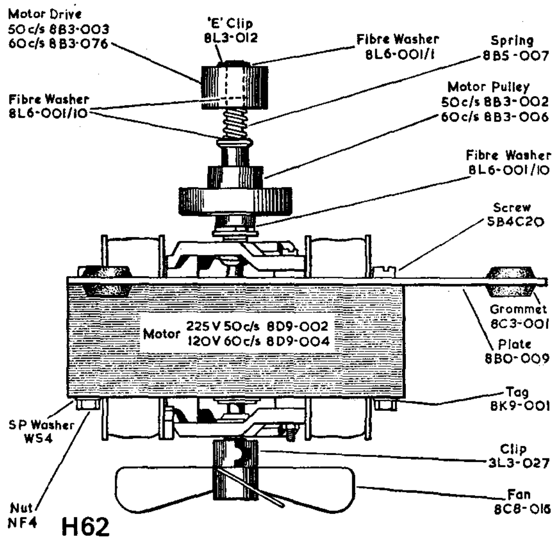
No.	Name	Part No.
39.	Signal head	8D5–014
40.	Signal head bracket—top	8B1–006
41.	Signal head bracket—base (pad 8B4–010)	8B0–001/1
42.	Clamp spring	8B5–002
43.	Signal head mount	8C5–018
44.	Signal head pivot spring	8B5–016
	Signal head clamping screw ½ in.	SB06C08
45.	Pinch wheel carrier pivot (screw SB04CC04; washer WSPB04)	8B3–038
46.	Centre tape guide	8B3–063
47.	Tape guide "A" (screw ST06C-C15)	8B3–039
48.	Tape platform "A" (precision washer 8L6–001/14)	8B1–046
49.	Insulating bushes	8C8–021
50.	Tape guide "B" (screw ST06C-C15)	8B3–040
51.	Tape platform "B" (tape guide head 8B3–057)	8B0–006
52.	Capstan bearing	8C5–029
53.	Securing clip	8B5–050
54.	Pause lever (circlip 8L3–008; fibre washer 8L6–001/12)	8B1–052
55.	Pause link (spring 8B5–035; nyloc nut 8L6–004; lock nut 8L6–009)	8B5–038
56.	Connecting link (grip ring 8L3–009)	8B0–018
57.	Pinch wheel toggle arm (circlip 8L3–008)	8C5–038
58.	Play con rod assembly (grip ring 8L3–009; circlip 8L3–008; fibre washer 8L6–001/12; spacer 8L7–009)	8B1–135
59.	Tension arm assembly: pad 8F7–006)	8M4–035
60.	Tension arm lift spring	8B5–015
61.	Play bell crank	8C5–037
62.	Wind/rewind interlock (circlip 8L3–008)	8B1–004
63.	Compression spring	8B5–054
64.	Spool rod—RH (circlip 8L3–008)	8B1–027
65.	Spool rod—LH (circlip 8L3–008)	8B1–028
66.	Spool rod spring	8B5–022
67.	Pause claw	8B1–067
68.	Pause claw spring (grip ring 8L3–009)	8B5–037
69.	Pause rod	8B1–056
70.	Pause return spring	8B5–036
71.	Wind/play interlock (fibre washer 8L6–001/6; clip 8L3–003; return spring 8B5–048)	8C5–047
72.	Play rod assembly—RH	8M1–044/001
73.	Play rod assembly—LH	8M1–044/002
74.	Secondary play rod	8M1–045
75.	Stop key assembly (trim 8B0–007/1)	8M4–027
76.	Control key assembly (trim 8B0–007/2)	8M4–025
77.	Rewind key insert	8B1–021
	Play key insert	8B1–021
	Stop key insert	8B1–051
	Pause key insert	8B1–050
	Forward key insert	8B1–021
78.	Key support bracket (screw SZD4 HP03)	8B1–033
79.	Key spring	8B3–053
80.	Latch plate	8B1–020
81.	Latch plate spring	8B5–011
82.	Shaft (circlip 8L3–008)	8B3–020
83.	Knob assembly-record button	8M4–079
84.	Record button mount	8B1–145
85.	Latch plate-record button	8B1–152
86.	Take-up drum assembly (washer 8L6–005)	8M4–033

No.	Name	Part No.
87.	Clutch lining	8F7–009
88.	Take-up clutch	8C8–003
89.	Take-up clutch spring	8B5–111
90.	Tape counter	8F4–002
91.	Counter belt	8C8–011
92.	Counter mount (screw SZ04H-P03)	8B1–022
93.	Record level meter—tracks 3&2	8F9–001/002
94.	Record level meter—tracks 1&4	8F9–001/003
95.	Record meter mount (screw SZ04HP03)	8B1–150
96.	Mount pad	8B4–015
97.	Control mounting bracket (screw SZ06HP03)	8M1–032
98.	Deck mounting grommet	8C3–002
99.	Grommet insert	8L7–021
100.	Top cover mounting bracket	8B0–021
101.	Take up wheel arm	8B1–008
102.	Capstan support plate riveting assembly (screw SB04CC04; washer 7892/22)	8M1–002
103.	Speed switch link	8C5–044
104.	Speed switch connecting rod (clip 8L2–008)	8B5–044
105.	Switch bell crank—tracks 1&4	8B1–147/001
106.	Bell crank coupling spring—short	8B5–023
107.	Bell crank coupling spring—long	8B5–084
108.	Switch bell crank pivot (circlip 8L3–008; retainer 8L3–010)	8B3–111
109.	Switch bell crank pivot bracket	8B1–141
110.	Switch bell crank—tracks 1&4	8B1–143/001
111.	Interconnecting rod—tracks 1&4	8B5–082
112.	Switch bell crank—tracks 3&5	8B1–147/002
113.	Switch bell crank pivot (circlip 8L3–008; retainer 8L3–010)	8B3–112
114.	Interconnecting rod—tracks 3&2	8B5–083
115.	Switch bell crank—tracks 3&2	8B1–143/002
116.	Circlip securing motor assembly (washer 7892/39)	8L3–008
117.	Flywheel and capstan assembly	8M4–011
118.	Bearing retainer clip	8B5–050
119.	Spherical bearing	8C5–029
120.	Thrust pad	8B4–004
121.	Primary arm assembly	8M4–038
122.	Primary arm shaft spring	8B5–033
123.	Primary arm loading spring	8B5–032
124.	Secondary arm assembly (fibre washer 8L6–010/18; circlip 8L3–008)	8M1–016
125.	Primary arm stop (clip 8L3–010)	8B3–062
126.	Index roller support plate (circlip 8L3–008)	8B1–019
127.	Speed change ramp	8C8–012
128.	Spool lever RH (circlip 8L3–008)	8M1–012
129.	Spool lever LH (circlip 8L3–008)	8M1–013
130.	Spool lever pivot pin RH or LH	8B3–013
131.	Spool lever spring RH or LH	8B5–030
132.	Stop solenoid bracket (screw SZO4HPO3)	8B1–064
133.	Pause solenoid bracket (screw SZ04HP03)	8B1–054
134.	Record button insert	8B1–151
135.	Muting switch push rod	8B1–137
136.	Drive puck wheel grinding assembly	8M4–015
137.	Record button pivot bracket	8M1–046
	grip ring	8L3–019
	PTFE washer	8L6–001/13)
138.	Play secondary rod spring	8B5–023
139.	Index roller	8B3–010
140.	Loading spring	8B5–031

MISCELLANEOUS

Name	Part No.
Stop solenoid assembly with bracket	8M4–030
Pause solenoid assembly with bracket	8M4–031

100–120 V 60 c/s Modification: The tape deck may be modified for 100–120 V 60 c/s operation by the replacement of three parts, viz. the motor, motor drive and motor pulley. The part numbers of the items required are indicated in the motor plate assembly diagram.

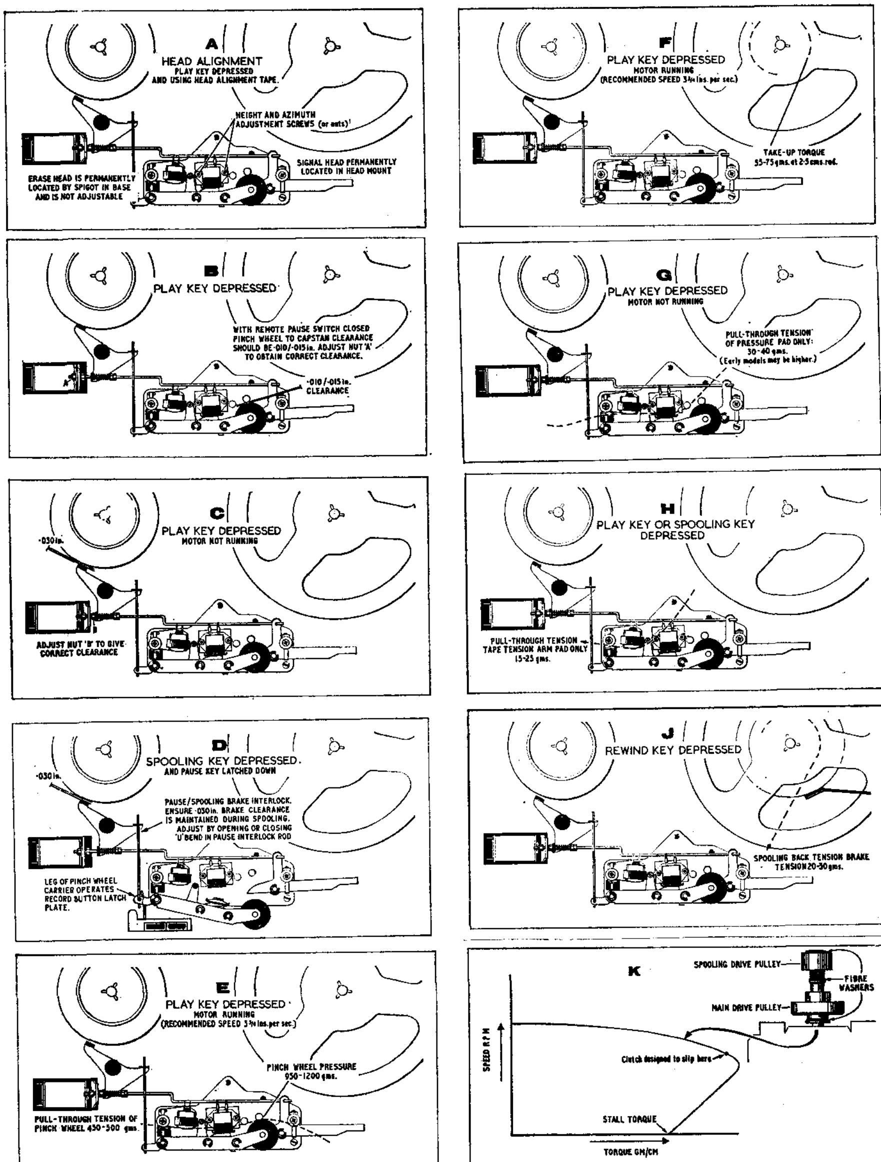


(H62) Motor Plate Assembly—DC432

Removal of Intermediate Puck Wheel: Release three circlips and flat washers securing motor plate assembly then lift assembly out carefully to avoid the risk of distorting the secondary arm (124). A piece of adhesive tape should now be pressed over the anchor post on the capstan support plate to prevent the drive wheel spring eye becoming detached. Lift spindle of primary arm assembly (121) to move drive puck wheel (136) over hole vacated by motor spindle, then remove circlip which retains secondary arm to primary arm. Remove secondary arm from machine complete with drive puck wheel. On reassembling wheel to spindle absolute cleanliness is essential. Assembly should be checked for minimum noise and free running before replacing in machine.

Removal of Head Plate Assembly: Remove grip ring to free pinch wheel assembly connecting link (56) from pinch wheel pressure bell crank or (if a grip ring remover is not available) remove circlip and play bell crank (61). Next, remove circlip from pinch wheel carrier pivot (45), detach left-hand tape guide "B" assembly (50) together with tape platform "B" (51), lift pinch wheel carrier assembly (28) and at the same time uncouple from pause interlock rod (24) to gain access to head plate fixing screw below it. Next, take out head plate fixing screws, remove circlip and fibre washer securing pause lever (54) to head plate (36) and lift off to free from pause link (55). To completely detach the head plate assembly from tape deck, it is necessary to unsolder erase head leads and unplug signal head leads.

Removal of Flywheel and Capstan Assembly (117): Disconnect amplifier and electrical assemblies. Invert chassis and take out five screws, securing support bracket, to permit access to screw hidden by SKT5; release bell crank spring (107), and also primary arm shaft spring (122) from respective holes in capstan support plate (102). Next, remove four cheesehead screws and flat



H63

(H63) Adjustments—Diagrams A to K

washers securing capstan support plate, also one self-tapping screw securing front edge. Now pull back index roller support (126) to release index roller (139), lift capstan support plate complete with moulded speed change ramp (127) and drive puck wheel grinding assembly (136). The capstan and flywheel assembly may now be removed.

Reassemble in reverse order. When reassembling flywheel and capstan assembly do not omit to refit take-up drum assembly (86), clutch lining (87), moulded take-up clutch (88), take-up clutch compression spring (89) and thrust washer on to capstan spindle. Also ensure that flat-sided bush on flywheel locates correctly in a similarly shaped socket in moulded take-up clutch. This operation is more easily effected from the top of the deck with the head plate assembly removed.

Adjustments: The mechanical tolerances and clearances given are provided as a guide for use when clearing a mechanical fault. A correctly operating deck need not be within the stated limits.

Diagram A shows method of adjusting azimuth and height setting of the signal head using a special test tape. (The special Thorn Height and Azimuth Test Tape Type 6 may be obtained from the manufacturers, Messrs Tutchings Electronics, 14 Rookhill Road, Frias Cliff, Christchurch, Hampshire.) This tape contains signals of 7·5 kHz recorded on track 3 only and 1·25 kHz recorded over the remainder of the tape.

The method of adjustment requires a simultaneous indication of both which can be obtained by selecting track 3. The azimuth is correct when the 7·5 kHz tone is at maximum and the height when the 1·25 kHz tone is at minimum. Height is adjusted by turning both screws in the same direction and azimuth by turning them in opposite directions.

As it is easy to determine a minima aurally, listening techniques are used to find the minima of the 1·25 kHz tone. On the other hand, because a maxima is difficult to recognise aurally, a meter should be used to determine the peak of the 7·5 kHz tone.

Diagram B illustrates the functions of the pause linkage during remote pause.

With "play" key depressed, and when the remote pause solenoid is energised, the clearance between the pinch wheel and capstan should be 0·010–0·015 in. At the same time the pause brake pad is lightly applied to the feed spool carrier to ensure an instant stop/start action of the pause. If the pause solenoid is out of adjustment proceed as follows:

1. Depress "play" key and check that pause solenoid is de-energised. Adjust nut B so that brake pad is clear of left-hand spool carrier by 0·030 in as in diagram C. Energise solenoid and with "play" key still depressed adjust nut A until gap between pinch wheel and capstan is 0·010–0·015 in. Then check that pause brake is applied to left-hand spool carrier as in diagram B.
2. Operate "stop" key and with the pause solenoid de-energised, but with the "pause" key depressed, open or close "U" bend in interlock rod to provide a gap of 0·030 in between pause brake and left-hand spool carrier as in diagram

D. Operate "play" key and finally release both "play" and "pause" keys to ensure that pinch wheel carrier returns and that pause brake is clear of left-hand spool carrier. If the stop solenoid is out of adjustment proceed as follows: With the stop solenoid energised, adjust nut and screw linking solenoid to latch plate, so that the lower edge of key insert is just out of contact when any key (except the "pause" key) is depressed. De-energise stop solenoid, depress "play" and "record" keys, then energise stop solenoid when, if correctly adjusted, the latch plate will release both keys.

Diagram E indicates the pull-through tension which the capstan and pinch wheel are capable of exerting on the tape when the "play" key is depressed and the motor running. A tension of approximately 450–500 gm indicates that the pressure of the pinch wheel compression spring is correct and also that excessive oxidisation of the pinch wheel has not occurred.

Diagram F shows the take-up torque exerted through the take-up clutch. A tension of 55–75 gm at 2·5 cm radius is required. If this figure is low or excessively high, the clutch disc has become worn or contaminated.

Diagram G indicates the correct load (30–40 gm) that should be imposed on the tape by the pressure pad assembly only. If this pressure is too high, excessive wow and flutter will result. On the other hand, if the load is considerably less than that quoted, it is probable that the pressure pad spring is weak and that with indifferent tape, "drop-outs" during recording would occur.

Diagram H shows the pull-through tension exerted by the tape tension arm pad only. This should be 15–25 gm and if incorrect may be rectified by bending the spring wire tensioning device.

Diagram J indicates the pressure (20–30 gm) that should exist on the spooling back tension brake when the "rewind" key is depressed. If incorrect, the return spring should be replaced.

Diagram K illustrates the action of the slipping motor pulley assembly. It can be seen that rotational slip between the motor pulley and the motor shaft can occur and the reasons for allowing controlled slip are twofold. Reference to the speed versus torque characteristic of the motor will clearly indicate that the stalled torque is lower than the maximum running torque. Thus it will be appreciated that unless the motor can be prevented from stalling, its maximum output cannot be utilised. Therefore, the slip between the motor pulley and the shaft has been arranged to occur when the load exceeds the safe running limit. At the commencement of spooling, however, the motor is able to deliver its maximum torque, when of course it is most necessary. In practice, the slip only happens when the spooling drive is first engaged; once the reels have picked up speed and the load on the motor is reduced, the slip ceases. Additionally, this controlled slip has the advantage of reducing skidding between the driving surface of the spooling wheels and greatly reduces wear on them. It also results in a much smoother acceleration of the reels when the drive is engaged, thereby reducing wear on the tape.

Fault Finding Chart:

Symptom	*Cause*	*Remedy*
1. Flutter	(*a*) Dirty capstan (*b*) Bent capstan or motor shaft	Clean Replace faulty part
2. Wow or slow running	(*a*) Oil on flywheel, motor pulley, pinch wheel or intermediate wheel (*b*) Weak intermediate wheel tension spring (*c*) Weak pinch wheel pressure spring (*d*) Oxide on pinch wheel (*e*) Stepped motor pulley slipping on "play"	Clean all drive surfaces with methylated spirit Replace spring Bend or replace Clean Replace loading spring
3. Motor fails to run	(*a*) Wiring fouling fan (*b*) Broken motor lead	Redress wiring Reconnect
4. Counter inaccurate	(*a*) Oil on drive belt or pulley (*b*) Oil gumming pulley bearing (*c*) Fluff in counter gears	Clean belt and pulley Clean out bearing and shaft with small brush dipped in benzine Remove with tweezers or replace counter
5. Counter not registering	(*a*) Counter drive belt stretched or out of place (*b*) Counter jamming	Replace or refit belt Fit new counter
6. Right-hand spool failing to take up on "play"	Play take-up friction wheel hold-on spring disconnected	Refit spring
7. No tape motion "play" or "record"	(*a*) Pause solenoid energized (*b*) Pause mechanism jammed	Check for wiring fault. Check operation of pause switch on microphone Check operation of pause claw, etc.
8. (*a*) Pinch wheel assembly not returning fully (*b*) Pinch wheel carrier assembly not retracting	Play secondary rod spring disconnected or sheltered Muting switch push rods jamming	Refit or replace Check linkages
9. Control keys not latching	(*a*) Latch plate spring disconnected or weak (*b*) Auto-stop solenoid wrongly adjusted	Refit or replace Readjust
10. Tape spillage	(*a*) Brake slip (*b*) One brake dragging	Wipe driving surface of spool carriers with cloth dampened with methylated spirit and rub Uno pounce or blackboard chalk (not french chalk) into brake pads Bend operating edge of brake thrust plate to equalise action

Symptom	*Cause*	*Remedy*
11. Capstan fails to rotate at correct speed	(*a*) Incorrect engagement of primary arm on speed change cam (*b*) Bent secondary arm	Readjust Straighten or replace
12. Record buttons (*a*) not latching when "play" keys depressed (*b*) not releasing when "play" keys are released	Latch plate not returning fully Pinch wheel carrier not returning fully Latch plate stroke insufficient	Adjust by bending leg of pinch wheel carrier See symtom 8 Adjust by bending leg of pinch wheel carrier

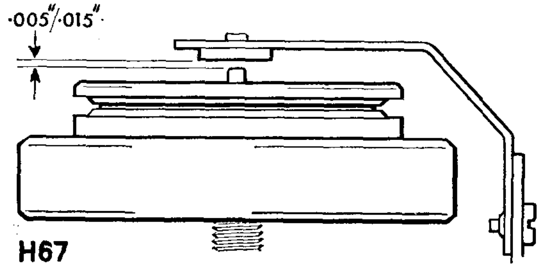
THORN — Tape Deck DE21

General Description: Cassette type tape deck. Cassette type: C60 or C90 compact cassette. Tracks: two (mono). Tape speed: $1\frac{7}{8}$ in/sec, capstan drive. Rewind time: 2 minutes approximately (C60). Wow and flutter: better than 0·5 per cent rms. Record level and battery indicator: moving coil meter. Batteries: 7·5 V (minimum 5·5 V), five HP11 cells. Control interlocks and latches: (*a*) "record" key is released when any other tape motion key is depressed, it cannot be operated when the "play" key is depressed; (*b*) cassette "knock-out" interlock prevents erasure of pre-recorded cassettes.

Removal of Flywheel and Capstan Assembly: Unfasten flywheel shaft retainer bracket (63) from side of chassis (two screws) and detach rubber drive belt (74). Lift off take-up clutch assembly (68) after removing small circlip which secures it to its pivot. The flywheel and capstan assembly (62) can now be lifted out. *Do not attempt to remove the flywheel and capstan assembly without first detaching the take-up clutch assembly.*

When replacing the flywheel, first ensure that the thrust washer (8L6-018/020) is fitted to the capstan shaft between the flywheel and the capstan bearing assembly: reassembly can then continue in the reverse order to the removal procedure but great care must be exercised to avoid bending or damaging the capstan. When refitting the drive belt, it will be necessary to remove the top screening plate of the motor to ensure that the belt is correctly located in the motor drive pulley. It is essential that the drive belt is not twisted and it is advisable to clean the belt and all drive surfaces with methylated spirit after reassembly is complete. When refitting the flywheel shaft retainer assembly, it is necessary to set the end float to 0·005–0·015 in. The fixing holes in the flywheel shaft retainer bracket are slotted to permit adjustment. To adjust, slightly loosen flywheel shaft bracket retainer screws and gently twist a small screwdriver blade, inserted the into tapered slot in the chassis located between the flywheel shaft retainer fixing screws.

(H67) Flywheel and Capstan Assembly—DE21



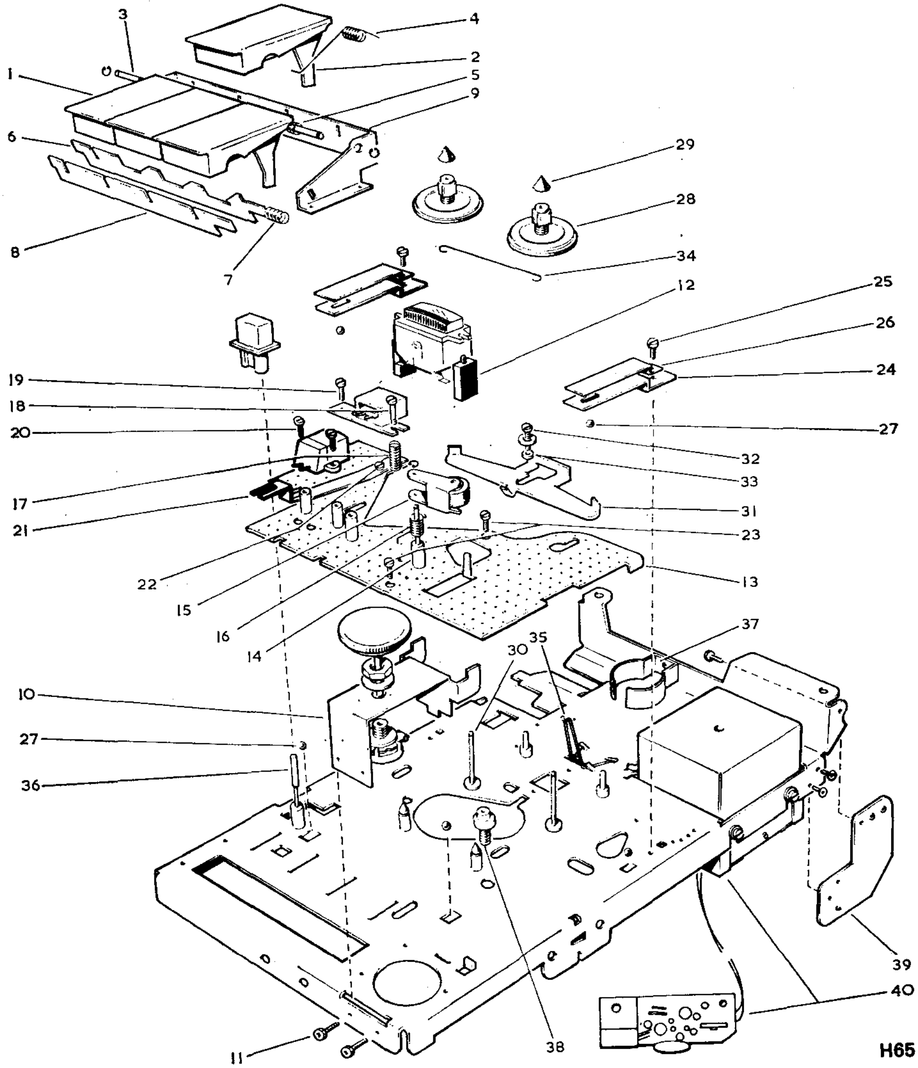
Motor and Motor Control Board Replacement: Take out single screw securing motor screening plate. Hinge plate upwards to enable motor drive belt (74) to be disengaged, then replace cover. Slacken three screws and washers securing motor assembly then slide the assembly out of slotted holes in chassis. Remove two screws to release motor control board and disconnect main printed board interconnecting leads. Reassemble in the reverse order, ensuring that

Key to Parts—see diagrams overleaf:

No.	*Part*	*List No.*
1.	Piano key—grey	8C8–074/001
	Piano key—white	8C8–074/002
2.	Piano key insert	8B0–025
3.	Key pivot shaft (circlip 8L3–008)	8B3–085
4.	Play key return spring	8B5–067
5.	Key return spring	8B5–075
6.	Latch plate	8B0–026
7.	Latch plate return spring	8B5–068
8.	Latch guide plate	8B0–027
9.	Key support bracket (screw SZ02-RP02)	8B1–122
10.	Meter and volume control bracket	8B1–123
11.	Screw securing meter and volume control bracket	SZ04HP03
12.	Meter mounting pad	8B4–014
13.	Top plate assembly "I"-type heads	8M1–040/003
14.	Pinch wheel pivot pin (8B3–108)	8M1–040/003
	13 and 14—for "M"-type heads	8M1–040/001
15.	Pinch wheel and bracket assembly (circlip 8L3–020)	8M1–041
16.	Pinch wheel loading spring	8B5–081
17.	Record head azimuth spring	8B5–080
18.	Record head retaining screw	8L6–029
19.	Record head retaining screw	8L6–032
20.	Erase head retaining screw	8L6–033
21.	Record button latch spring	8B5–069
22.	Screw securing record button latch spring	8L6–030
23.	Screw securing top plate to pulley release arm	8L6–025
24.	Ballbearing retainer	8B1–119
25.	Screw securing ballbearing retainer	SZ04HP03
26.	Ballbearing retaining spring	8B5–066
27.	Ballbearing	8C5–041
28.	Spool carrier assembly	8M4–064
29.	Spool carrier assembly retaining cap*	8C8–067
30.	Spool carrier spindle	8B3–103
31.	Brake	8B1–130
32.	Brake retaining screw	8L6–026
33.	Brake spacing bush	8L7–011
34.	Brake return spring	8B5–079
35.	Cassette retaining spring	8B5–072
36.	Record button pillar	8B3–106
37.	Loudspeaker retaining clip	8B5–076
	Alternative retaining grommet	8C8–131
38.	Capstan bearing housing assembly	8M4–067
39.	Battery contact assembly (small)	8M1–037

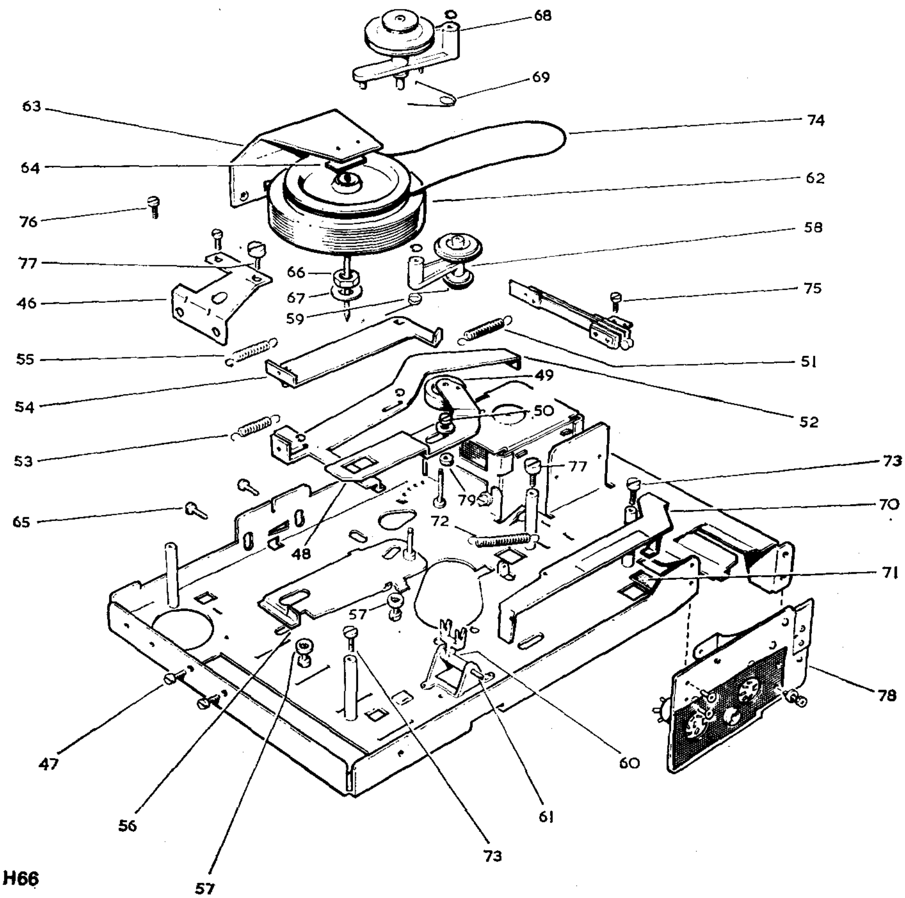
* If removed, this cap should be renewed.

No.	*Part*	*List No.*
40.	Motor and motor control board assembly	8D9–008
46.	Regulator board mounting bracket	8B1–129
47.	Screw retaining regulator board bracket	8L6–026
48.	Bracket rewind jockey assembly	8M1–042
49.	Rewind jockey wheel (circlip 8L3–021)	8C8–061
50.	Screw retaining rewind jockey bracket (washer WPMB06)	8L6–026
51.	Rewind jockey bracket tension spring	8B5–071
52.	Switch actuating arm (circlip 8L3–021)	8B1–118
53.	Switch actuating arm tension spring	8B5–071
54.	Pulley release arm assembly	8M1–036
55.	Pulley release arm tension spring	8B5–077
56.	Rewind bracket assembly	8M1–034
57.	Spacing bush	8L7–007
58.	Idler and spooling wheel arm assembly (circlip 8L3–020)	8M4–113
59.	Idler and spooling wheel loading spring	8B5–070
60.	Record switch pivot arm	8C8–063
61.	Record switch pivot pin	8L5–008
62.	Flywheel and capstan assembly	8M4–059
63.	Flywheel shaft retainer bracket	8M1–035
64.	Flywheel shaft thrust bearing—8C8–057	8M1–035
65.	Screw retaining flywheel shaft bottom bearing bracket	8L6–026
66.	Capstan bearing nut	8L6–023
67.	Capstan bearing washer	8L6–022
68.	Take-up clutch assembly (circlip 8L3–020)	8M4–070
69.	Take-up arm spring	8B5–078
70.	Interlock bracket	8B1–125
71.	Interlock bracket buffer	8C3–011
72.	Interlock tension spring	8B5–071
73.	Main printed board fixing screw	8L6–026
74.	Rubber drive belt	8C8–050
75.	On/off switch fixing screw	8L6–026
76.	Motor control board fixing screw	8L6–024
77.	Cabinet base retaining screw	8L6–058
78.	Socket and battery terminal assembly	8M1–038
79.	Spacing bush	8L7–007



(H65) Top View of Tape Deck—DE21

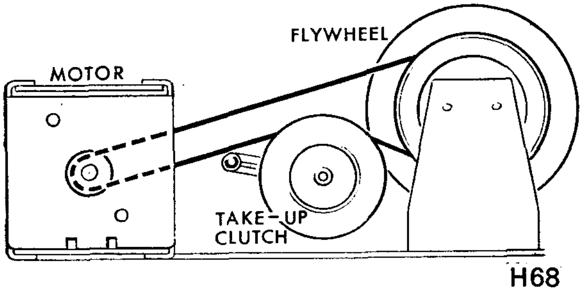
the drive belt is not twisted and that the belt and all drive surfaces are clean. It may also be necessary to readjust the motor speed control to obtain the correct tape speed. Note correct position of the rubber drive belt as indicated in the diagram (H68).



H66

(H66) UNDERSIDE VIEW OF TAPE DECK—DE21

Top Plate Assembly Removal: The top plate assembly (13) moves on six ballbearings (27) and when dismantling care should be taken to avoid losing them. Two of these ballbearings are on top of the top plate and lie under the ball-retainer assemblies (24 and 26); the latter are each secured by a single self-tapping screw (25). Unsolder the erase and play head connections, then remove the ball-retainer assemblies and ballbearings, and also take out two screws (23) which secure the top plate to studs on the pulley release arm (54). The top plate assembly and the four ballbearings beneath can now be removed. Re-assemble in the reverse order ensuring that the four ballbearings are correctly seated in the recesses in the chassis before replacing the top plate, and that a ballbearing is also located in the slot of each ball-retainer assembly.



(H68) MOTOR AND MOTOR CONTROL BOARD—DE21

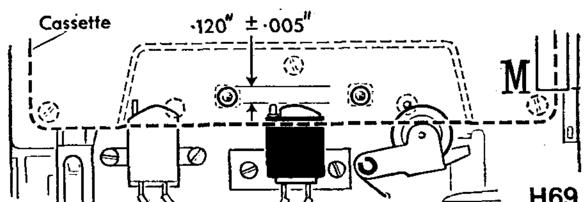
Record/Play Head: The two screws (23) passing through slotted holes into the studs of the pulley release-arm assembly (54) provide fore and aft adjustment to achieve the correct penetration of the record/play head into the cassette. The distance from the front face of the record/play head to the back edge of the cassette locator should be $0 \cdot 120 \pm 0 \cdot 005$ in when the "play" key is depressed. Reseal the screw heads with paint following this adjustment which is shown in the diagram (H69). When replacing a record/play head it may be necessary to add or remove one or two fibre (8L6-001/022) shim washers to maintain alignment between the erase head, record/play head and the pinch wheel, see diagram H70. A check of horizontal alignment of the heads with the pinch wheel carrier should be made by sighting the pinch wheel between the pips of the signal and erase heads. In later models correction may also be made by rearranging the shim washers above or below the pinch wheel.

Note: When replacing either the erase head of the record/play head, reference should be made to the identification code letter stamped on the top plate. A few decks were manufactured fitted with "M"-type heads with no identification stamp.

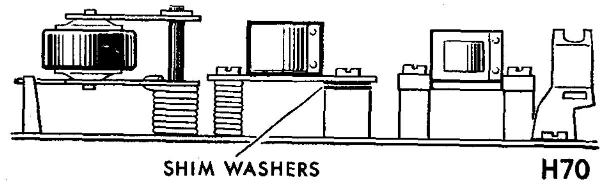
Coded "I"	8D5-018 (erase)	8D5-017 (record/play)
Coded "M"	8D5-011 (erase)	8D5-010 (record/play)

Piano Key Replacement: Take out two PK screws from each end of the key support bracket (9) to release the complete piano key assembly, then remove the appropriate circlip to permit the withdrawal of the key pivot shaft (3) sufficiently to release the faulty key. When fitting the replacement ensure that the key levers engage correctly in or against the associated levers under the chassis. The brake (31) is secured by a single 3 mm screw (32), washer and spacing bush (33). The bracket rewind jockey riveted assembly (48) is also

(H69) TOP PLATE ASSEMBLY—DE21



(H70) RECORD/PLAY HEAD DETAILS—DE21



secured by a single 3 mm screw (50), washer and spacing bush (79). The switch actuating arm (52) and rewind bracket assembly (56) are secured by $1\frac{1}{2}$ mm "E" clips over spacing bushes (57). The moulded rewind jockey wheel (49) is also retained by a $1\frac{1}{2}$ mm "E" clip. The idler and spooling wheel arm assembly (58) and the take-up clutch assembly (68) are retained by 1·9 mm "E" clips.

Spool Carrier Assembly Replacement: To remove a spool carrier assembly (28) first unclip the conical-shaped moulded retaining cap (29). Once removed this cap is ineffective and should be replaced by a new part. The spool carrier can now be withdrawn from its support spindle (30). Reassemble in the reverse order but note that one or two washers (8L6-018/020) should be fitted below the spool carrier assembly (as on the original assembly) and a similar washer should be fitted at the top before fitting the replacement conical retaining cap. When applying pressure to replace this cap the chassis should be supported underneath, as near as possible to the spindles to avoid bending the chassis.

Cleaning and Lubrication: The use of cleaning fluids such as petrol or carbon-tetrachloride, which might damage plastic surfaces or rubber drives, should be avoided. A soft cloth dampened with methylated spirit should be used to clean drive surfaces and head faces. All moving parts are lubricated during manufacture and further lubrication during service should rarely be necessary. If, however, it becomes necessary to replace any of the moving parts, only the slightest amount of a very light machine-oil should be applied to the bearing surfaces, ensuring that it does not find its way on to the drive surfaces. Over-lubrication can also attract dust which may cause excessive drag on parts of the mechanism.

Pinch Wheel Pressure: Depress "play" key and, with a spring balance attached to the pinch wheel bracket, check the pull required to lift the pinch wheel away from the capstan, i.e. when the pressure roller just fails to turn. This should be 320–400 gm at pinch wheel spindle and may be adjusted, when necessary, by transferring the spring end into any of the five spring fixing holes in the top plate (13), i.e. clockwise to reduce pressure and anti-clockwise to increase pressure.

Pinch Wheel Bracket Clearance: In the play position, the clearance between the arm of the pinch wheel bracket and the stop on the top plate should be 0·03 in. This can be adjusted by bending the stop on the top plate.

Take-up Clutch Assembly: Insufficient tension of take-up arm spring (69) will cause the take-up pulley to slip, whereas too much tension may result in defective operation of the take-up clutch. The tension of spring (69) should be

70–100 gm at the centre of the take-up spindle, and should be measured with a spring balance attached to the idler arm. Depress the "play" key and note the spring balance reading when the take-up reel just fails to drive. If incorrect, move spring end to alternative anchor hole in chassis, i.e. clockwise to reduce tension and anti-clockwise to increase. Before checking the pressure of the take-up pulley against the spool carrier tyre, thoroughly clean both the drive surfaces. Take-up torque at the spool carrier should be 25 gm/cm–55 gm/cm. A high take-up torque can cause the tape to ride out of the guides and cause damage to the tape. To rectify, it is necessary to replace the complete take-up clutch assembly (68).

Note: Mechanical tolerances and clearances are given as a guide for use when clearing a mechanical fault. A correctly operating deck need not be within the stated limits.

TELEVISION SERVICING

ACKNOWLEDGEMENTS

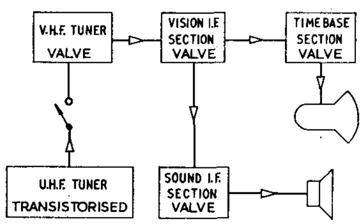
British Radio Corporation Ltd.
C.R.T.S. Ltd.
Radio and Allied (Holdings) Ltd.
Radio Rentals Ltd.
Rank Bush Murphy Ltd.
R.T.S. Ltd.

BAIRD 660, 670 and 680 Series

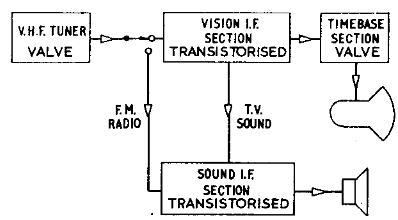
General Description: Dual-standard television receivers, some of which are also equipped for F.M. radio reception.

Types of Receiver: There are six types of receiver in the 660, 670 and 680 Series: 660 Series T.V. only (all-valve I.F. section); 660 Series T.V. only (transistorised I.F. section); 670 Series T.V. only, 670 Series T.V./F.M. radio; 680 Series T.V. only, 680 Series T.V./F.M. radio.

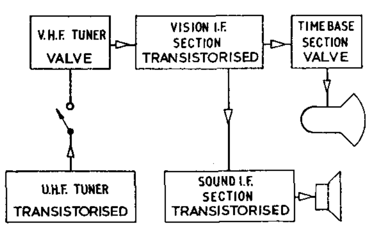
Note: The block diagrams show the four different circuit arrangements; the titles are the same as those on the corresponding circuit diagrams.



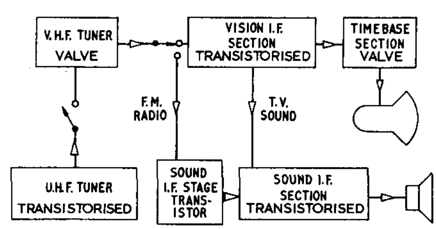
660 SERIES T.V. ONLY (ALL-VALVE I.F. SECTION)



670 SERIES T.V./F.M. RADIO



660, 670 & 680 SERIES T.V. ONLY



680 SERIES T.V./F.M. RADIO

H103

Models	*Circuit diagram*
661, 662, 663, 664, 665 (early) . . (later) . .	660 Series T.V. only (all-valve I.F. section) 660, 670 and 680 Series T.V. only
671, 672, 673, 674, 675, 676 . .	660, 670 and 680 Series T.V. only
677	670 Series T.V./F.M. radio
681, 682, 683, 685	660, 670 and 680 Series T.V. only
687, 688	680 Series T.V./F.M. radio
11, 12, 15, 16 (Baird distributors) .	660, 670 and 680 Series T.V. only

Operating Frequencies and Line Standards: All receivers are equipped to operate on both 405- and 625-line standards. Receivers with both V.H.F. and U.H.F. tuners are normally dispatched from the factory with the following tuning facilities:

12 V.H.F. 405-line positions in Bands I and III, with fine tuning control.

1 U.H.F. 625-line position with adjustable tuning to cover channels 21 to 68 in Bands IV and V.

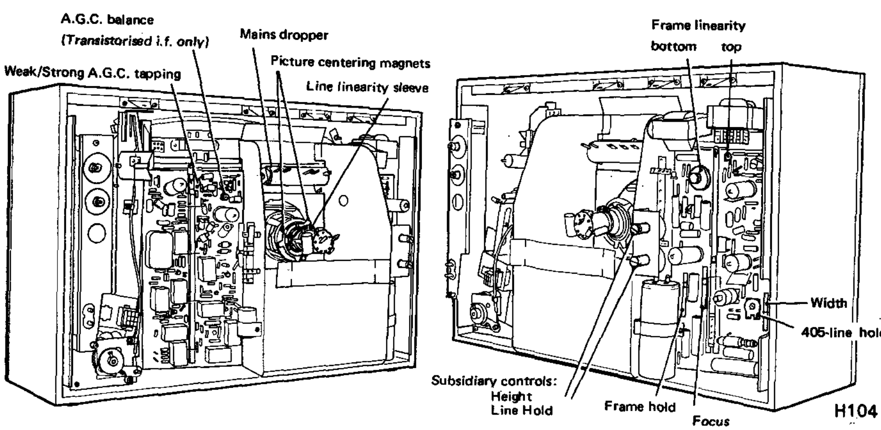
Any receiver can be converted for 625-line V.H.F. operation by changing the cam of the system switch and fitting suitable coil biscuits in the channel selector.

Mains Supply: 50Hz A.C. only, adjustable from 200 to 250V.

Mains Connector: 660 *Series:* Mains lead soldered to connections on tuner assembly. (The tuner chassis must be connected to the neutral wire of the supply.) 670 *and* 680 *Series:* Non-reversible two-pin connector and plug. (The mains lead must be connected in agreement with the L and N markings on the plug.)

Power Consumption: Approximately 170W.

Fuse: $1\frac{1}{2}$ A, $1\frac{1}{4}$-inch cartridge, mounted on the tuner assembly.



(H104) CONTROLS—660, 670 AND 680 SERIES

Subsidiary Controls: These are accessible to the user and are mounted at the back of the cabinet: height control; line hold control.

Note: This line hold control is effective on both 405- and 625-line operation. There is a pre-set line hold control, accessible only when the back of the cabinet is removed, which affects 405-line operation only. It enables the 405-line hold to be set so that the user control is equally effective on both line standards.

Pre-set Controls: 1. The tappings on the mains dropper are set in the factory for a 240V supply. 2. The weak/strong tapping is used to prevent overloading when a receiver is operating in an area of high signal strength. 3. Picture

centering is achieved by the two annular magnets on the neck of the C.R.T. They can be rotated together or independently. 4. Line linearity is adjusted by sliding the linearity sleeve along the neck of the C.R.T. after loosening the clamp on the deflector coil assembly. The clamp must always be retightened after an adjustment and the sleeve must not be pushed too far into the coil assembly or the coils will overheat. 5. The pre-set A.G.C. control on the I.F. panel (fitted only on receivers with transistorised I.F. sections) is set at the factory. It should rarely need adjustment, but if it does, test equipment will be required.

Installation: Make sure the mains dropper tappings are correct for the supply available. (The dropper is visible through the ventilation slots in the cabinet back, and a tapping chart is given on each circuit diagram.) Connect the aerial and mains leads, making sure that the mains lead is wired correctly. Switch on the receiver and allow 1–1½ minutes for warming-up. Then carry out the V.H.F. and (if applicable) the U.H.F. tuning operations.

V.H.F. Tuning: 1. Select the required V.H.F. channel and turn the brightness control clockwise until the screen lights up. 2. Turn the volume control clockwise until either the T.V. sound or a background hiss is heard. 3. Adjust the V.H.F. fine tuning control to give maximum volume of T.V. sound, then adjust the volume control as required. 4. If the picture is steady, adjust the contrast and brightness controls to give a clear picture with good black and white contrast. A slight re-adjustment of the fine tuning control may improve both picture and sound. 5. If the picture is not steady, and the receiver has a U.H.F. tuner, complete the U.H.F. tuning procedure before touching the pre-set controls.

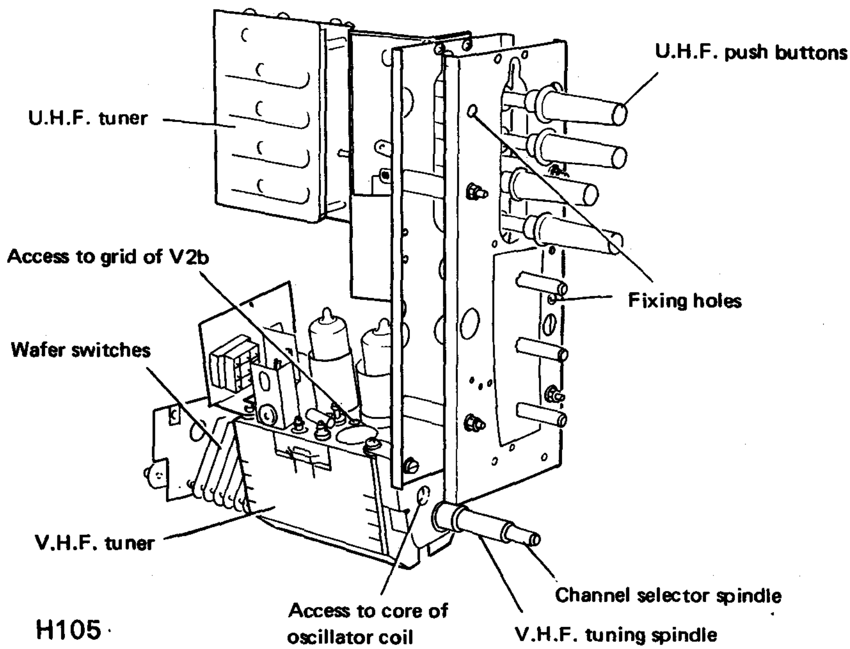
U.H.F. Tuning: 1. Set the channel selector in the U.H.F. position. 2. If a rotary tuner is fitted, turn the control backwards and forwards until the picture is found. As the picture is affected more than the sound by the setting of the control, tune for the best picture with no sound-on-vision and no vision-on-sound, and then adjust the volume control as required. 3. If a push-button tuner is fitted, press the button for the required channel and tune as for a rotary tuner by turning the button.

Adjusting the Subsidiary Controls: Stages 2 to 8 of this procedure establish whether the user line hold control is equally effective on both 405- and 625-line operation. 1. Set the correct picture height, if necessary. The picture should slightly overlap the top and bottom of the screen. 2. Select a 625-line channel. 3. Turn the user line hold control fully anti-clockwise and make the picture go out of lock by changing to another channel and back again, or by removing and re-inserting the aerial plug. 4. Rotate the control again until the picture locks, and note the position of the control knob. 5. Repeat stages 3 and 4, but this time start by turning the control fully clockwise. 6. Set the control mid-way between the two positions found, and note its position. 7. Select a 405-line channel and repeat stages 3, 4, 5 and 6. 8. If the picture cannot be made to lock, or if the final position of the control differs by a large amount from that found in stage 6, the pre-set line hold control must be adjusted.

Warning: Stand on an insulating surface while carrying out any adjustments

with the pre-set controls. Make absolutely sure the mains lead is wired correctly to the mains plug. Use non-conducting tools for adjusting the controls, where appropriate.

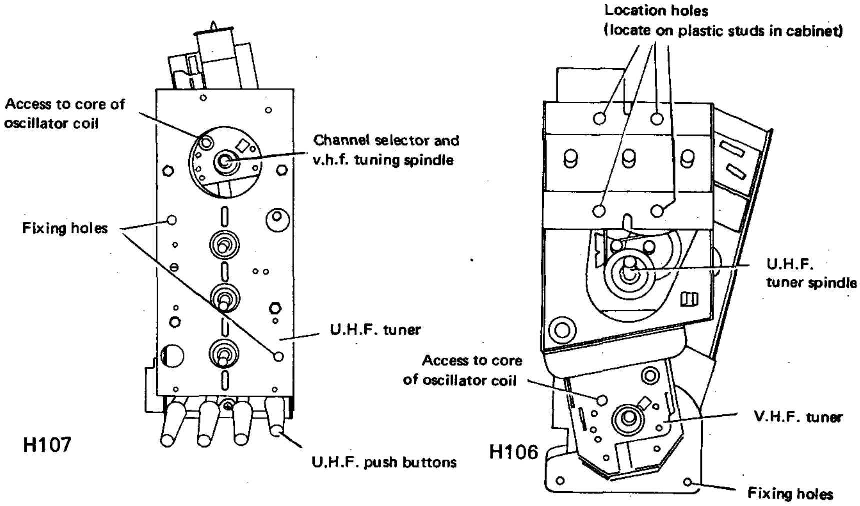
Adjusting the Pre-set Controls: Adjust these controls to correct any picture faults not caused by incorrect tuning or incorrect setting of the subsidiary controls. The instructions given below are intended only as a guide; it will probably not be necessary to adjust all the controls. However, it is important to make sure that the pre-set line hold control is set so that the user line hold control is equally effective on both 405- and 625-line operation (stages 6 to 11 below).



(H105) Assemblies With a Rotary Control—660, 670, and 680 Series

1. Switch off the receiver, disconnect the aerial and mains leads and remove the back of the cabinet. 2. Make sure the tappings on the mains dropper are correct for the supply available. There is a connection chart on the relevant circuit diagram. 3. Re-connect the aerial and mains leads, switch on the receiver, and allow it to warm up. 4. Make sure the weak/strong tapping is in the correct position for the local signal strength. 5. Adjust the frame hold control to stop the picture from rolling in a vertical direction. It may be that the picture is steady with the control in any position; if so, set the control for optimum interlace. 6. Set the user line hold control in the position found in stage 6 of the procedure for setting the subsidiary controls. 7. Select a 405-line channel. 8. Rotate the pre-set line hold control fully anti-clockwise and make

the picture go out of lock by changing to another channel and back again, or by removing and re-inserting the aerial plug. 9. Rotate the pre-set line hold control again until the picture locks, and note its position. 10. Repeat stages 8 and 9, but this time start by rotating the control fully clockwise. 11. Set the pre-set line hold control midway between the two positions found. The user line hold can now be used to lock the picture on both line standards. In the unlikely event that the picture cannot be made to lock, set the flywheel line oscillator. 12. Centre the picture. 13. Set the frame linearity. 14. Set the picture width. The picture should slightly overlap each side of the screen. 15. Set the line linearity. 16. Focus the picture.

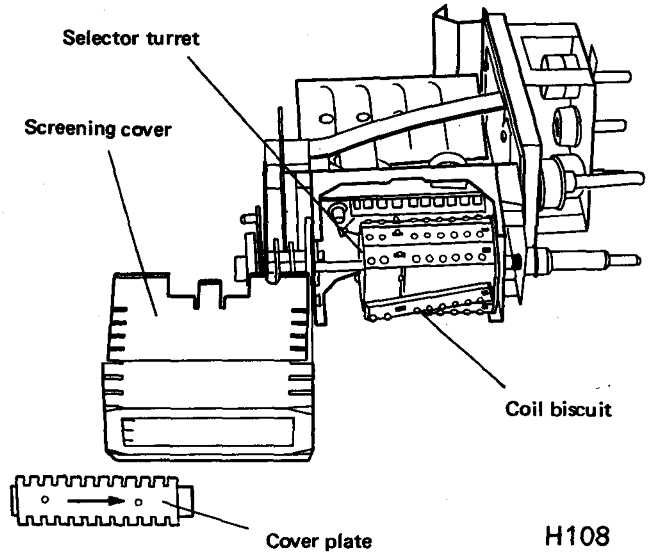


Right: (H106) VERTICAL-LINE PUSH-BUTTONS—660, 670 AND 680 SERIES; *Left:* (H107) HORIZONTAL-LINE PUSH BUTTONS—660, 670 AND 680 SERIES

Tuner Assemblies: There are four types of tuner assembly: 1. Assemblies with V.H.F. tuner only (e.g. as fitted to model 677). 2. Assemblies with V.H.F. and U.H.F. tuners, with a rotary control for U.H.F. tuning (diagram H105). 3. Assemblies with V.H.F. and U.H.F. tuners, with push-button U.H.F. tuning (push-buttons arranged in a vertical line, diagram H106). 4. Assemblies with V.H.F. and U.H.F. tuners, with push-button U.H.F. tuning (push-buttons arranged in a horizontal line, diagram H107). 5. The last three of these types only are shown in the diagrams; the fixing arrangements and other details of "V.H.F. only" assemblies are similar to those of assemblies with rotary U.H.F. tuning. 6. All assemblies are connected to the main chassis by two-pin and multi-way plugs, and to the aerial/mains panel by soldered-on aerial and mains lead.

V.H.F. Tuners: These incorporate turret type channel selectors with removable coil biscuits. Fine tuning is achieved by a variable inductor (L12 on all circuit diagrams).

If the tuner assembly is removed from the cabinet, the metal screening cover can be taken off the tuner to allow access to the inside. The cover must always be refitted before the tuner assembly is put back into the cabinet. There is a removable plate in the cover, at the bottom of the tuner, to allow access to the channel coil biscuits. An arrow on the plate indicates the direction in which the plate must be slid to release it.



(H108) V.H.F. Tuners—660, 670 and 680 Series

U.H.F. Tuners: In the field, receivers may be found fitted with any one of three types of tuner, and all three types are interchangeable: 1. Tuners with Mullard transistors. 2. Tuners with Fairchild transistors. 3. Tuners manufactured by R. & E. Hopt, KG. Fine tuning on all three types of tuner is achieved by an internal four-gang capacitor. Rotary tuning controls operate the capacitor by means of a friction wheel, with a cord drive to the tuning dial. On push-button tuners the capacitor is operated by a crank inside the tuner casing. The crank is moved by a pushrod operated by tappets screwed on to the threaded shafts of the buttons, so that the tuning on each channel can be set by turning the appropriate button.

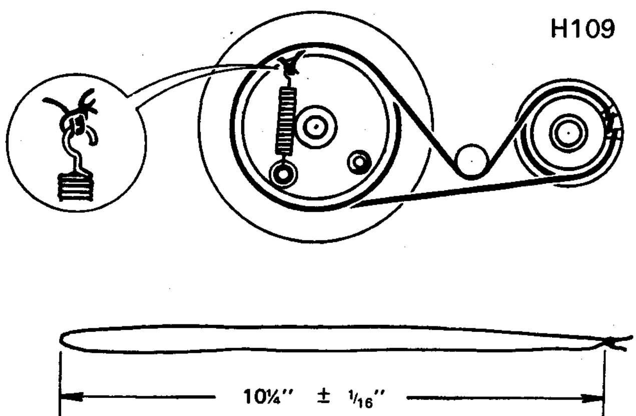
Note: Unless U.H.F. alignment equipment is available, all servicing operations must be confined to the components on the outside of the tuner. Do not disturb the lid.

Operations With Tuner Assembly In Place: With the assembly in place, the channel coil biscuits can be changed, and the core of the oscillator coil of the V.H.F. tuner can be adjusted. The channel selector and V.H.F. tuning knobs must be removed for the latter operation.

Changing Coil Biscuits: There is an access hole in the cabinet underneath the V.H.F. tuner; on some models this is covered by a removable fibre plate. 1. Place the cabinet face downwards, and remove the fibre plate, if applicable. 2. Slide the removable plate on the tuner screening cover in the direction of the arrow until one end is released, then slide it the other way to release it completely. 3. Make sure the correct biscuit is in position at the bottom of the tuner. To do this, set the channel selector knob to the channel number corresponding to the required biscuit, then rotate it five positions anti-clockwise. 4. Release the biscuit by forcing its retaining clip towards the back of the cabinet and pulling down the end nearest the back of the cabinet. 5. Fit the replacement biscuit by inserting the end farthest from the retaining clip hole into the turret. Press the other end up until the biscuit clips into place. 6. Refit the removable plate to the V.H.F. tuner screening cover, and refit the fibre plate if applicable. 7. Tune the V.H.F. tuner oscillator coil.

Operations With Tuner Assembly Removed From Cabinet: Except for tuning the V.H.F. tuner oscillator coil, electrical adjustments must be carried out with the assembly removed from the cabinet. The assembly must be removed from the cabinet for re-stringing the scale drive on a rotary U.H.F. tuner, and for replacing separate components.

Removing Tuner Assembly From Cabinet: 1. Disconnect the aerial and mains plugs, and remove the back of the cabinet. 2. Pull off the user control knobs, wrapping a clean cloth round them if necessary to obtain sufficient grip. (If the receiver has push-button U.H.F. tuning, do not attempt to remove the push-buttons.) 3. Remove the two screws holding the aerial/mains panel on to its supporting brackets. 4. Disconnect plugs P3, P4, P5 (and P7, 680 Series T.V./F.M. radio receivers). 5. Release the system switch cable from the tuner by removing the bottom clamp screw and sliding the looped end off the pin. 6. Remove the two screws securing the tuner assembly to the cabinet, and withdraw the aerial/mains panel and tuner assembly.



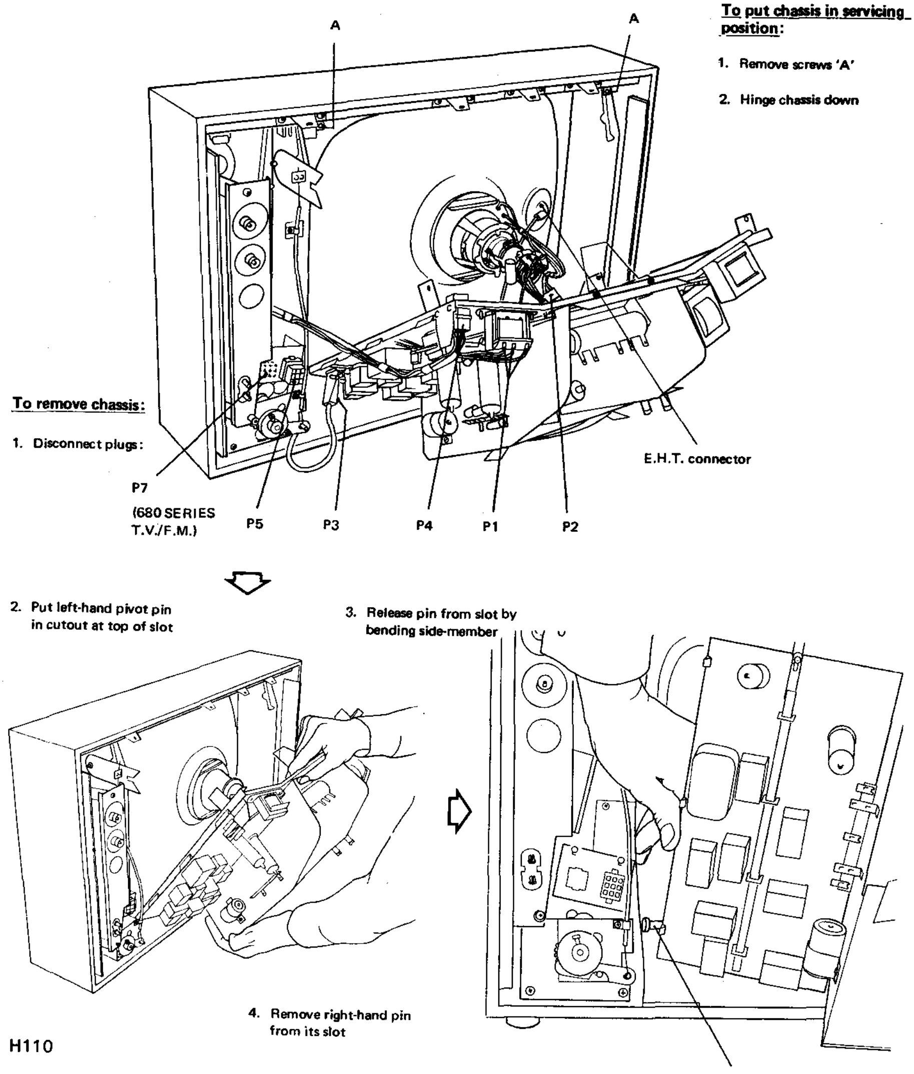
(H109) ROTARY U.H.F. TUNER SCALE DRIVE—660, 670 AND 680 SERIES

Refitting Tuner Assembly Into Cabinet: 1. Arrange all loose leads for ease of connection and make sure they will not be trapped when the assembly is fitted. 2. Place the assembly in the cabinet and insert the control spindles through the holes in the cabinet. 3. *Assemblies with rotary U.H.F. tuning, or with V.H.F. tuner only:* Make sure no leads are fouling the tuner drive (if fitted), and position the assembly so that the four plastic studs in the cabinet enter the four holes at the top of the fixing bracket. *Assemblies with push-button U.H.F. tuning:* Make sure the fixing studs in the cabinet enter the correct two holes in the fixing bracket. 3. Fit the two fixing screws. 4. Refit the aerial/mains panel to its brackets. 5. Reconnect plugs P3, P4, P5 (and P7, 680 Series T.V./F.M. radio receivers). 6. Refit the clamp and looped end of the system switch cable to the tuner assembly. 7. *Assemblies with rotary U.H.F. tuning:* Turn the U.H.F. tuner drive spindle clockwise until the small plastic wheel reaches the end of its travel. Then fit the U.H.F. dial to the spindle with the letters "UHF" in the twelve o'clock position. 8. Fit the remaining control knobs, and make sure they all turn freely. 9. Test the operation of the system switch when changing from a 405-line channel to a 625-line channel. If necessary, re-set the switch.

Rotary U.H.F. Tuner Scale Drive: (see Diagram H109): The drive is strung with Jones Stroud MC11, nylon-covered glass-fibre cord. Use a piece of cord about 22 in. long to make a loop as shown. Trim off the loose ends to about $\frac{1}{2}$ in. and seal the knot with wax or varnish, taking care not to damage the covering of the cord. 1. Remove the tuner assembly from the cabinet. 2. Remove the four screws securing the bracket which supports the volume, contrast and brightness controls, take off the old cord, and remove the tension spring. 3. Loop the new cord and attach it to one end of the tension spring as shown. 4. Turn the large plastic wheel fully anti-clockwise, and set the small one with its notches in the three o'clock position, as shown in the illustration. 5. Hook the free end of the tension spring on to the "left hand" anchoring peg. Do not fit a retainer yet, as it may be necessary later to transfer the spring to the other peg. 6. Starting from the point where it is fixed to the tension spring, wind the cord anticlockwise round the large wheel, straight on to the small one. 7. Wind the cord anticlockwise once round the small wheel, make a loop in it, and fit the loop into the slots in the rim of the wheel. 8. Take the cord round the "top" of the small wheel, and "under" the idler roller. 9. Wind the cord anticlockwise round the large wheel, forcing it over the rim in the later stages so that it drops into the slot and the tension spring lies flat. 10. Make sure the cord is not too near the flangeless sides of the wheel rims, then test the drive by turning the control spindle so that the large pulley moves to its fully clockwise position. 11. If the drive is satisfactory, fit a Salter retainer to secure the tension spring. 12. If the cord tension is incorrect, adjust it as follows, then fit a retainer to secure the spring:

(*a*) To tighten the cord, transfer the tension spring to the other anchoring peg.

(*b*) To tighten or slacken the cord, adjust the position of the idler roller. Slacken the screws which secure the roller bracket, move the roller to the



(H110) Chassis Details—660, 670 and 680 Series

required position and re-tighten the screws. 13. Refit the bracket which carries the volume, contrast and brightness controls.

Main Chassis: Most servicing operations can be carried out with the chassis either in place in the cabinet or with it partly withdrawn in the "servicing position". The receiver can be operated normally with the chassis in both these positions, without the need for disturbing any connecting leads and plugs.

Operations With Chassis In Place: With the chassis in place, there is access to all the test points on the printed panels, and the "component" sides of the panels. The metal plate which covers the line output transformer compartment can be removed to give access to the transformer, the boost and E.H.T. rectifying diodes, and the line output valve.

Operations With Chassis In Servicing Position: With the chassis in the servicing position, all the components on it are accessible. There is also access to the back of the C.R.T. and to the resistor and capacitor connected between the tube harness and chassis.

Putting Chassis In Servicing Position: (see Diagram H110.) To gain access to the print side of the I.F. panel, remove the metal screen by loosening the two hexagon-headed screws and pulling the screen away from the chassis.

Operations With Chassis Removed: It is obviously necessary to remove the chassis in order to replace the C.R.T. Although it is possible to replace the printed panels with the chassis in the servicing position, it is recommended that this operation be carried out with the chassis removed.

Removing and Refitting Chassis: To refit the chassis, reverse the procedure shown in the illustration (H110).

The System Switch (see Diagram H111). This performs the necessary switching for changing between 405- and 625-line, V.H.F. and U.H.F., and F.M. radio operation, as applicable.

The switch consists of two parts; there are wafer switches on the channel selector spindle, and a cam on the spindle operates two slider switches on the printed panels. Switching between 405- and 625-line operation is done by the slider switches, the one on the I.F. panel changes the operating speed of the line timebase to give a 405- or 625-line raster. All other switching is done by the wafer switches. The cam on the channel selector spindle moves an operating lever connected to a cable, and the other end of the cable is attached to a lever with a V-notch cut in its free end. In the V-notch rests one end of a rocking lever which is connected to the slider switches, one each side of its fulcrum. The cam therefore tilts the rocking lever and moves each slider switch to one or the other of its two positions. Receivers with U.H.F. tuners are normally fitted with a cam which gives 625-line operation on U.H.F. only. It is possible to modify the mechanism to give 625-line operation on V.H.F. channels; this is done by removing the existing cam and fitting one with a different locus.

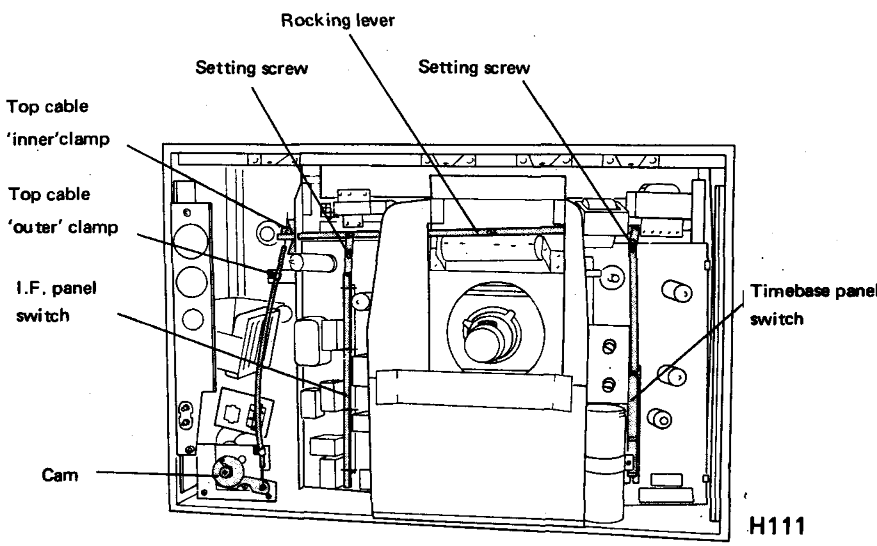
Setting System Switch: 1. Loosen the top cable inner and cable outer clamp screws, and the setting screws (see diagram H111). 2. Push the slider switch on the I.F. panel fully down. 3. Move the left-hand end of the rocking lever almost to the bottom of its travel. Make sure that it does not foul the top of the I.F. panel and that the other end does not foul the mains smoothing choke or the frame output transformer. 4. Tighten the setting screw on the I.F. panel slider switch on the timebase panel fully up and tighten its setting screw. 5. Operate the rocking lever so that both slider switches move fully up and down. Check that the switch contacts make correctly in both positions, and that the rocking lever does not foul anything. 6. Set the channel selector in a 405-line position. 7. Move the left-hand end of the rocking lever fully up. Make sure

the outer of the cable is not twisted or in compression, and tighten the top cable inner and cable outer clamp screws. 8. Inspect the operation of both slider switches while turning the channel selector to a 625-line position and back again. Make sure the contacts engage correctly in both positions, and that the operating linkage does not foul anything.

Maintenance of System Switch Contacts: If faulty operation is thought to be caused by the slider switches: 1. Check the operation of the switches to see whether proper contact is being made by the fixed and moving contacts. If proper contact is not being made, replace the switch by fitting a new switch, panel, or chassis, whichever is usual practice. 2. If switch operation seems satisfactory, clean the contacts as follows:

(*a*) Remove the dirt with a small, soft brush dipped in a suitable cleaning solvent. Do not dip the brush into the tin; pour out a small quantity for the operation and throw it away afterwards.

(*b*) When the fluid has evaporated from the contacts, lubricate them by brushing lightly with a suitable switch lubricant, for example: thirty parts white spirit : one part Sternol Caboline oil.



(H111) System Switch Details—660, 670 and 680 Series

Removing and Fitting Line Output Transformer: 1. Disconnect the aerial and mains leads and remove the back of the cabinet. 2. Remove the plate from the line output transformer compartment by unscrewing the four hexagon-headed screws. 3. Put the chassis in the servicing position. 4. Remove the E.H.T. connector from the C.R.T. and release the two P-clips securing the E.H.T. lead to the front of the chassis. 5. Unsolder the lead from the tag at the front of the line output transformer. 6. Remove the top clips from the boost

diode and line output valve. 7. Push the top of the chassis back to its normal position, but do not refit the fixing screws. 8. Tilt the cabinet forward on to a padded support, so that the underside of the line output transformer is accessible. 9. Unsolder the leads from the tags on the tansformer. 10. Gain access to the head of the transformer fixing screw, which is on the outside of the left-hand plate of the transformer compartment, as follows:

(*a*) If an additional sound I.F. stage (PA11) is fitted (680 Series T.V./F.M. radio receivers), remove its retaining nuts and slide it off the studs.

(*b*) If an additional sound I.F. stage is not fitted, loosen the nut securing the retaining clip of the large blue capacitor on the left of the transformer compartment (C150 on receivers with all-valve I.F. sections, C140 on all others). Rotate the capacitor clockwise around its securing stud to uncover the head of the screw. *Note:* On some early receivers in the 660 Series, C150 is fitted at the other side of the transformer compartment and the screw head is readily accessible.

11. Take out the fixing screw and remove the transformer by sliding it towards the back of the chassis so that the front fixing lug disengages from its slot. If a new transformer is to be fitted, transfer to it the E.H.T. rectifying diode from the old one, or fit a new diode, as necessary. 12. Fit the new transformer by reversing the procedure detailed above.

Replacing C.R.T.: 1. Remove the chassis from the cabinet. 2. From the left-hand chassis support, remove the nut and bolt which secure the earth lead of the deflection coil assembly and the C.R.T. harness earthing capacitor and resistor. 3. Loosen the clamp screw on the deflection coil assembly, pull the assembly off the neck of the C.R.T., and fit a protecting cap over the C.R.T. pins. 4. Place the cabinet face downwards. 5. On 20-in. models, remove both chassis supports. On 23-in. models. remove the right-hand chassis support. 6. Remove the four nuts securing the corners of the C.R.T. harness. 7. Take off the four rectangular washers, and from the top left-hand stud remove the harness earthing components and the short piece of wire which forms a cable tie. 8. Handling the C.R.T. by the bowl and screen only, lift it out of the cabinet. To fit the new C.R.T., carry out the above procedure in reverse. Fit the C.R.T. with the E.H.T. connection to the right and make sure it is firmly and squarely in place before fitting the nuts and washers. Fit the harness earthing components with the clear plastic sleeving to the harness fixing stud.

Replacing I.F. and Timebase Panels: 1. Remove the chassis from the cabinet. 2. Take out the screw connecting the appropriate slider switch to the system switch rocker arm. 3. Release the panel from the three clips at its outer edge and withdraw it from the three V-notches holding its inner edge. 4. If the I.F. panel is being removed, take off the screen at the front of the chassis after loosening the retaining screws. 5. Unsolder the connecting wires and transfer them to the new panel. 6. Clip the new panel into place. If the I.F. panel was removed, refit the screen to the front of the chassis. 7. Refit the chassis into the cabinet and set the system switch. 8. Make sure the valves, and in the case of the I.F. panel, the transformer cans, are securely in place.

9. If components on the panels have been changed or adjusted, carry out the necessary alignment procedure.

Safety: Observe the following precautions when carrying out any adjustment while the receiver is operating:

1. Feed the supply to the receiver via a 350W mains isolating transformer constructed to B.S.2214. If such a transformer is not available, make absolutely sure that the neutral wire of the supply is connected to the receiver chassis.

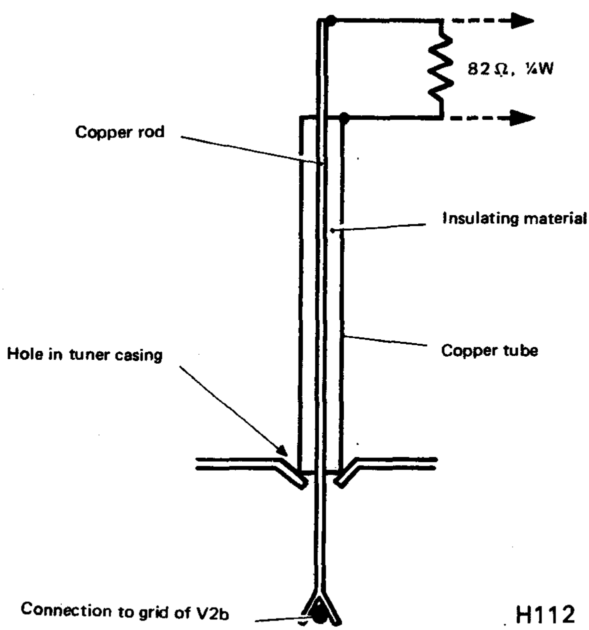
2. Some test equipment may have an earth connection in its mains wiring. If so, break the connection to prevent a bond between mains neutral and earth when the equipment is connected to the receiver, *and mark the fact that this has been done on the equipment concerned.*

3. Stand the receiver and test equipment on an insulating surface.

Alignment (Test Equipment): The equipment required for the alignment procedures is listed in each case:

A sweep frequency generator is required for some operations. An 82Ω ¼W resistor must be connected between the inner and outer conductors at the end of the generator's output lead.

If the available generator has no internal marker generator, a signal generator can be used to produce a marker pip. Couple the output leads of both generators and monitor the output on an oscilloscope. Adjust the output of the signal generator until the pip becomes just sufficiently visible on the trace.



(H112) ALIGNMENT PROBE—660, 670 AND 680 SERIES

Calibrate the signal generator before using it, for example as follows:

(*a*) Switch a television receiver to the local Band I station and couple the output lead of the generator to it.

(*b*) With the generator switched to the range to be used during the subsequent procedure, tune it for zero beat with the sound carrier.

(*c*) Compare the frequency indicated on the generator dial with the known frequency of the sound transmission.

Allow the signal generator and sweep generator to warm up for 20 minutes before using them.

A special probe (see diagram H112) is required for injecting a signal at the grid of V2b (the mixer valve in the V.H.F. tuner).

A low impedance source of D.C. bias is required for the I.F. alignment procedures (0–9 V for all-valve I.F. sections and 0–25 V for transistorised I.F. sections). This may consist of a dry battery of suitable voltage, a single-pole on/off switch and a 1 k wirewound potentiometer. Connect the battery across the ends of the potentiometer track, with the switch in series. Take off the bias supply from the wiper and one end of the track of the potentiometer, observing the correct polarity as detailed in the appropriate alignment procedure.

Six- and nine-way plugs, connected by leads of suitable length, are required for operations with the tuner assembly removed from the cabinet.

For some adjustments, either one or two shorting links are required. A suitable link consists of a 6-in. length of insulated wire with a crocodile clip connected at each end.

Alignment (Access):

1. *V.H.F. Tuner:* This must be removed from the cabinet for some operations, and it is necessary to inject signals at the grid of V2b (mixer valve), using the probe shown in diagram H112.

2. *U.H.F. Tuner:* Unless U.H.F. alignment equipment is available, all servicing operations must be confined to the outside of the tuner; do not disturb the lid.

3. *I.F. Transformer Cores:* As the transformer cans must be left in position when the receiver is operating, the cores can normally only be adjusted from the print side of the panel, and the chassis must therefore be put in the servicing position. The cores can be adjusted from the component side of the panel if the cans are replaced by ones having suitable holes in them. If this is done, the original cans must be refitted after adjustments have been made.

Adjustment of V.H.F. Tuner Oscillator Coil: This is one of the four on the channel coil biscuit (the one nearest the front of the tuner). There is access through a hole in the front of the tuner to the core of the coil corresponding to the selected channel:

(*a*) *Equipment Required:* Trimming tool: non-inductive, at least 6 in. long.

(*b*) *Procedure:* Select the required channel, then remove the inner and outer knobs of the V.H.F. tuner.

Note: If the coils on other channel biscuits are to be tuned, a small control knob such as the one on the volume control can be fitted on the channel selector

spindle for ease of turning. The required channels can be selected by reference to the markings on the channel selector knob.

Switch on the receiver and allow 1–1½ minutes for warming up. Turn the fine tuning spindle to the mid-point of its travel. Insert the trimming tool through the holes in the cabinet and tuner, and adjust the core for correct tuning. Switch off the receiver and refit the control knobs.

Alignment of All-valve I.F. Section:

(*a*) *Equipment Required:*

Signal generator: Covering the range 5–42 MHz, with provision for 30 per cent modulation at 400 Hz or 1 kHz.

Sweep frequency generator: Sweep range not less than ±2 MHz centred on 6 MHz, and ±6 MHz centred on 37 MHz.

Oscilloscope: (Such as Telequipment D43), Y-amplifier bandwidth from D.C. to at least 3 MHz.

Low impedance source of D.C. bias: Variable from 0–9 V.

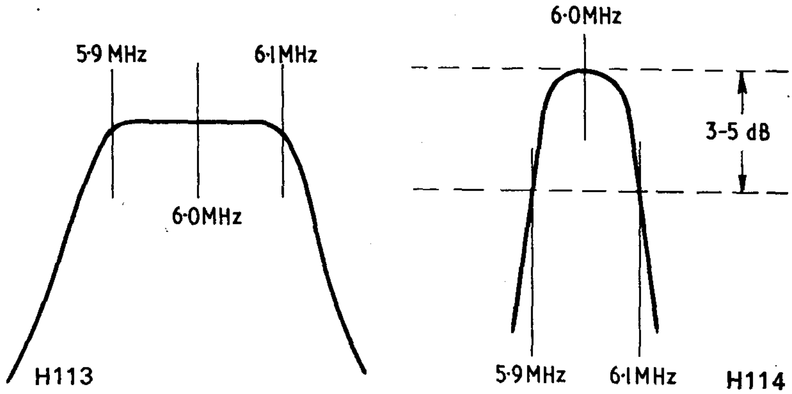
Probe: For injecting signals into the grid of V2b.

Extension leads: For operating the receiver with the tuner assembly removed from the cabinet.

A trimming tool and Shorting Link are also required.

(*b*) *Procedure:*

1. Remove the tuner assembly from the cabinet and connect it to the chassis with the extension leads.
2. Put the chassis in the servicing position, switch on the receiver, and allow it to warm up for at least 3 minutes.
3. Make sure the weak/strong tapping is in the "weak" position, turn the contrast control to the "maximum" position, and turn the volume control to the "minimum" position.
4. Select a 625-line channel.
5. Connect the bias supply, set at 9 V, between chassis (positive) and one end of R44 (negative).
6. Disconnect one end of C117, connect the input lead of the oscilloscope to TP8, and from the sweep generator inject a 6 MHz signal with a sweep of ±2 MHz at TP6.
7. Adjust cores of L76 and L77 to obtain a symmetrical response curve centred on 6 MHz, see diagram H113.
8. Transfer the output lead of sweep generator to TP3 and trim L69, L71 and L73 in that order, to obtain a symmetrical response curve centred on 6 MHz, see diagram H114.
9. Reconnect C117 and disconnect the sweep generator from TP3.
10. Connect the oscilloscope to TP9, and from the signal generator inject a 6 MHz signal, modulated 30 per cent, at TP3.
11. Trim L77 for minimum trace amplitude on the oscilloscope.
12. Connect the output lead of the signal generator to the grid of V2b with the special probe.
13. Reduce the voltage of the bias supply to 2 V.



Left: (H113) Response Curve of All-valve I.F. Section—660, 670 and 680 Series; *Right:* (H114) Response Curve of All-valve I.F. Section—660, 670 and 680 Series

14. Calibrate the oscilloscope so that the Y-deflection corresponding to 2 V peak-to-peak is known, and connect its input lead to TP3.

15. From the signal generator inject signals, modulated 30 per cent, at the following frequencies. Adjust the appropriate coil cores to obtain a maximum or minimum response as indicated, and adjust the level of the input signal as each coil is brought into resonance so as to maintain an output of approximately 2 V peak-to-peak:

Input signal frequency (MHz)	*Coil*	*Core*	*Trace amplitude*
37·2	L33	Bottom	Maximum
35	L34	Top	Maximum
36·4	L28	Bottom	Maximum
34·75	L29		Maximum
41·5	L26	Top	Minimum
31·5	L22	Top	Minimum
33·5	L21	Bottom	Minimum

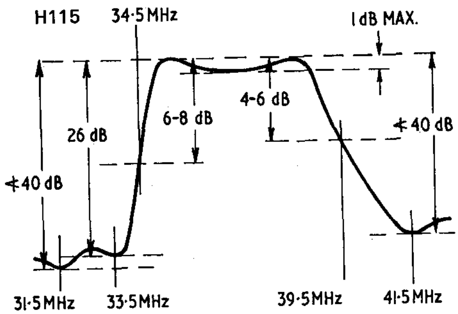
Note: The "bottom" core is the one nearest print side of panel and L29 has only one core.

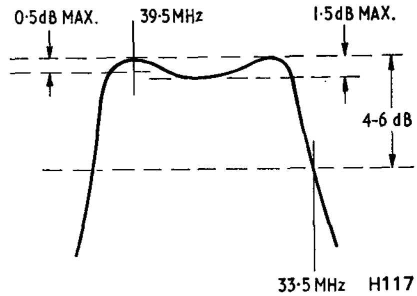
16. Select a 405-line channel and connect the input lead of the oscilloscope to TP7.

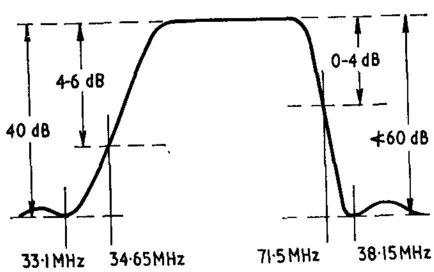
17. Set the output of the signal generator to 38·15 MHz, modulated 30 per cent, and trim L78/L79, L70/L72 and L68, in that order, for maximum trace amplitude, see diagram H115. Reduce the level of the input signal as each coil is brought into resonance, to avoid A.V.C. action.

18. Transfer the input lead of the oscilloscope back to TP3.

19. Set the output of the signal generator, modulated 30 per cent, at each of the following frequencies in turn. Trim the appropriate coils to obtain a







H116

Top Left: (H115) Response Curve of All-valve I.F. Section—660, 670 and 680 Series; *Bottom Left:* (H116) Response Curve of All-valve I.F. Section—660, 670 and 680 Series; *Above:* (H117) Response Curve of All-valve I.F. Section—660, 670 and 680 Series

maximum or minimum trace amplitude as indicated, and adjust the level of the input signal as each coil is brought into resonance so as to maintain an output of approximately 2 V peak-to-peak:

Input signal frequency (MHz)	*Coil*	*Trace amplitude*
38·15	L32	Minimum
38·15	L20	Minimum
33·15	L23	Minimum
39·65	L24	Minimum
37·15	L14	Maximum
34·3	L25	Maximum

Note: The "top" core of L23 is adjusted and L24 may not be fitted.

20. Select a 625-line channel and observe the response curve.

21. Adjust the bottom core of L33 to set the 625-line vision carrier (39·5 MHz) at a point −6 dB down the response skirt.

22. Trim L28 to level the response curve plateau. Check that the resulting curve lies within the limits specified, see diagram H116.

23. Select a 405-line channel and observe the response curve.

24. Trim L34 to set the 405-line vision carrier (34·65 MHz) at a point −5 dB down the response skirt.

25. Trim L25 to level the response curve plateau. Check that the resulting curve lies within the limits specified, see diagram H117.

26. Switch off and disconnect all the test equipment and make sure the weak/strong tapping is in its original position, unless the U.H.F./V.H.F. tuner coupling is to be aligned immediately.

Alignment of Transistorised I.F. Sections:

(*a*) *Equipment Required:*

Signal generator: Covering the range 5–42 MHz, with provision for 30 per cent modulation at 400 Hz or 1 kHz.

Sweep frequency generator: Sweep range not less than ±2 MHz centred on 6 MHz, and ±6 MHz centred on 37 MHz.

Oscilloscope: (Such as Telequipment D43), Y-amplifier bandwidth from D.C. to at least 3 MHz.

Low impedance source of D.C. bias: Variable from 0–25 V.

Probe: For injecting signals at the grid of V2b.

Extension leads: For operating the receiver with the tuner assembly removed from the cabinet.

Trimming tool.

(*b*) *Procedure:*

1. Remove the tuner assembly from the cabinet and connect it to the chassis with the extension leads.

2. Put the chassis in the servicing position, switch on the receiver and allow it to warm up for at least 3 minutes.

3. Turn the contrast and brightness controls to their "minimum" positions.

4. Make sure the weak/strong tapping is in the "weak" position.

5. Select a 405-line channel.

6. Disconnect one end of C122, connect the input lead of the oscilloscope to TP12, and from the sweep generator inject a signal at 6 MHz with a sweep of ±2 MHz at TP9.

7. Adjust the cores of L28/L29 and L30 to obtain a symmetrical response centred on 6 MHz, see diagram H118.

8. Select a 625-line channel and connect the sweep generator to TP6. Adjust the cores of L23, L22 and L41, in that order, to obtain the response shown in diagram H119. As the coils come into resonance, reduce the level of the injected signal to prevent overloading.

Note: After adjusting L41 it may be necessary to re-adjust L23 and L22 to obtain a symmetrical response centred on 6 MHz.

9. Reconnect C122 and connect the oscilloscope to TP11.

10. Check that the response curve is as shown in diagram H120, reduce the level of the injected signal as much as possible to avoid distortion.

11. Connect the sweep generator to TP9, and the oscilloscope to TP10.

12. Set the sweep generator output at 38 MHz with a sweep of ±4 MHz, and trim L31 and L32 for maximum symmetrical response centred on 38·15 MHz.

13. Connect the sweep generator to TP8, select a 405-line channel, and trim L24 and L25 for maximum symmetrical response centred on 38·15 MHz.

14. If the receiver is 680 Series T.V./F.M. radio and the additional sound I.F. stage (PA11) is to be aligned, perform the alignment before proceeding further, start at stage 2.

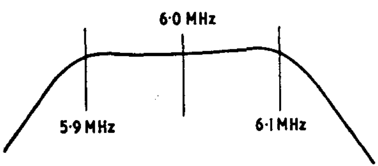
15. Select a 625-line channel.

16. Calibrate the oscilloscope so that the Y-deflection corresponding to an input of 1 V peak-to-peak is known, and connect its input lead to TP5.

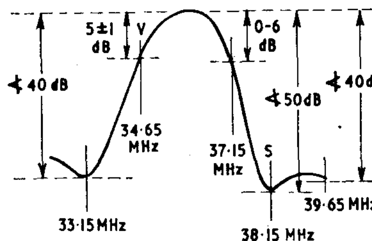
17. Connect the variable bias supply between chassis (negative) and TP2 (positive).

18. Connect the output lead of the signal generator to the grid of V2b with the special probe.

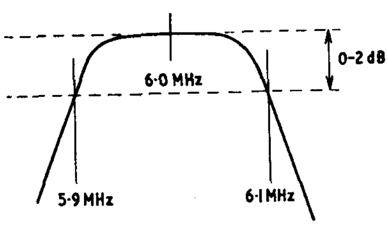
19. Set the signal generator output at 36MHz, modulated 30 per cent.



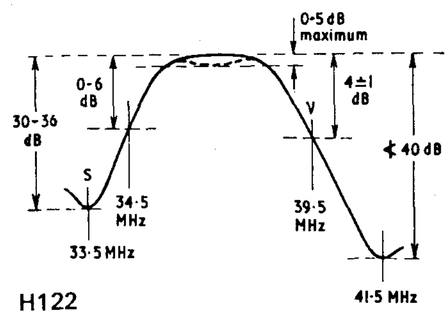
H118



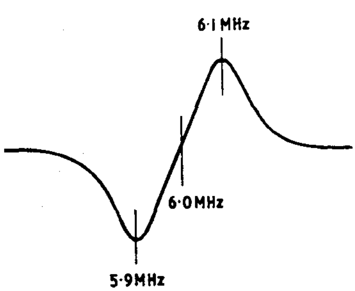
H121



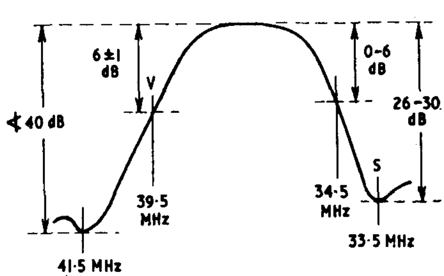
H119



H122



H120



H123

Top Left: (H118); *Centre left:* (H119); *Lower left:* (H120) RESPONSE CURVE OF TRANSISTORISED I.F. SECTION—660, 670 AND 680 SERIES; *Top right:* (H121); *Centre right:* (H122); *Lower right:* (H123) RESPONSE CURVE OF U.H.F./V.H.F. TUNER COUPLING—660, 670 AND 680 SERIES

20. Set the timebase of the oscilloscope so that the detected signal produces a modulated trace on the oscilloscope screen, and adjust the variable bias supply to give maximum trace amplitude.

21. Adjust the output of the signal generator so that the amplitude of the oscilloscope trace represents 1 V peak-to-peak.

22. Trim L36, L33 and L26 for maximum trace amplitude.

23. Set the output of the signal generator at 39·65 MHz and trim L19 for maximum output.

24. Set the output of the signal generator at 37·15 MHz and adjust L14 for maximum output.

25. Increase the level of the injected signal, or the sensitivity of the oscilloscope, or both, and set the signal generator output at 41·5 MHz.

26. Trim L27 for minimum output, making sure that the rejection notch of L27 is precisely located at 41·5 MHz.

27. Set the signal generator output at 33·5 MHz and trim L18 for minimum output, making sure that the rejection notch of L18 is precisely located at this frequency.

28. Select a blank 405-line channel.

29. Tune the output of the signal generator to each of the following frequencies in turn. Trim the appropriate coils for minimum output:

Input signal frequency (MHz)	*Coil*
37·7	L34
38·15	L39, L44
39·65	L21
33·15	L20

30. Disconnect the signal generator from the grid of V2b and connect the sweep generator in its place, setting the sweep width at $\pm$6 MHz, centred on 37 MHz.

31. Adjust the output of the sweep generator so that the oscilloscope indicates a waveform of amplitude 1 V peak-to-peak.

32. Increase the voltage of the variable bias supply to reduce the response by 20 dB, i.e. to reduce the height of the oscilloscope trace to one-tenth of its original value (0–1 V peak-to-peak).

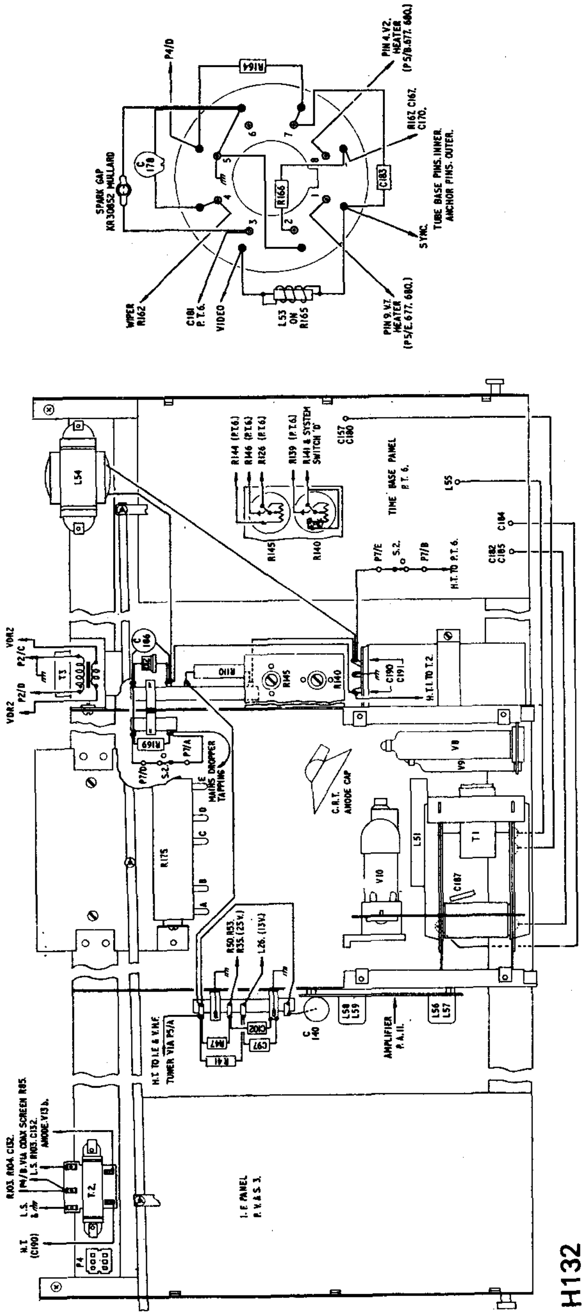
33. Increase the level of the injected signal to restore the trace to its original height.

34. Trim L38 for a symmetrical response.

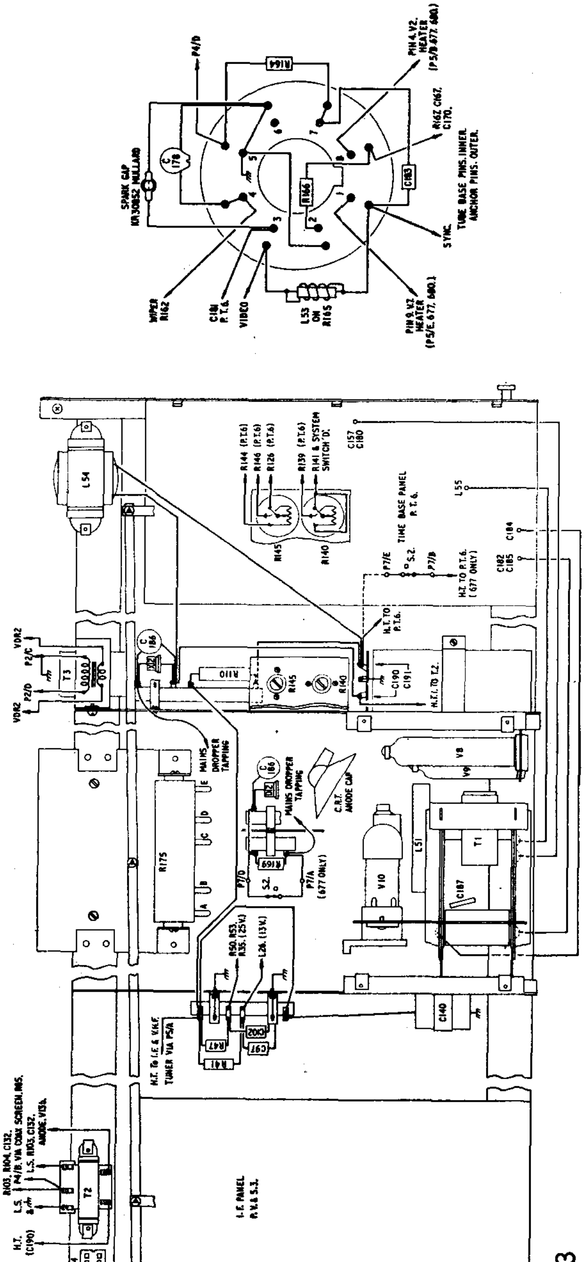
35. Trim L36 to set the vision carrier (34·65 MHz) 5 dB $\pm$ 1 dB down the H.F. skirt of the response (diagram H121).

36. Select a 625-line channel.

37. Trim L26 to set the bandwidth, L19 to correct the tilt of the response curve, and L14 to set the 625-line vision carrier (39·5 MHz) 4 dB $\pm$ 1 dB down the response skirt. Make sure the resulting curve lies within the limits specified in diagram H122.

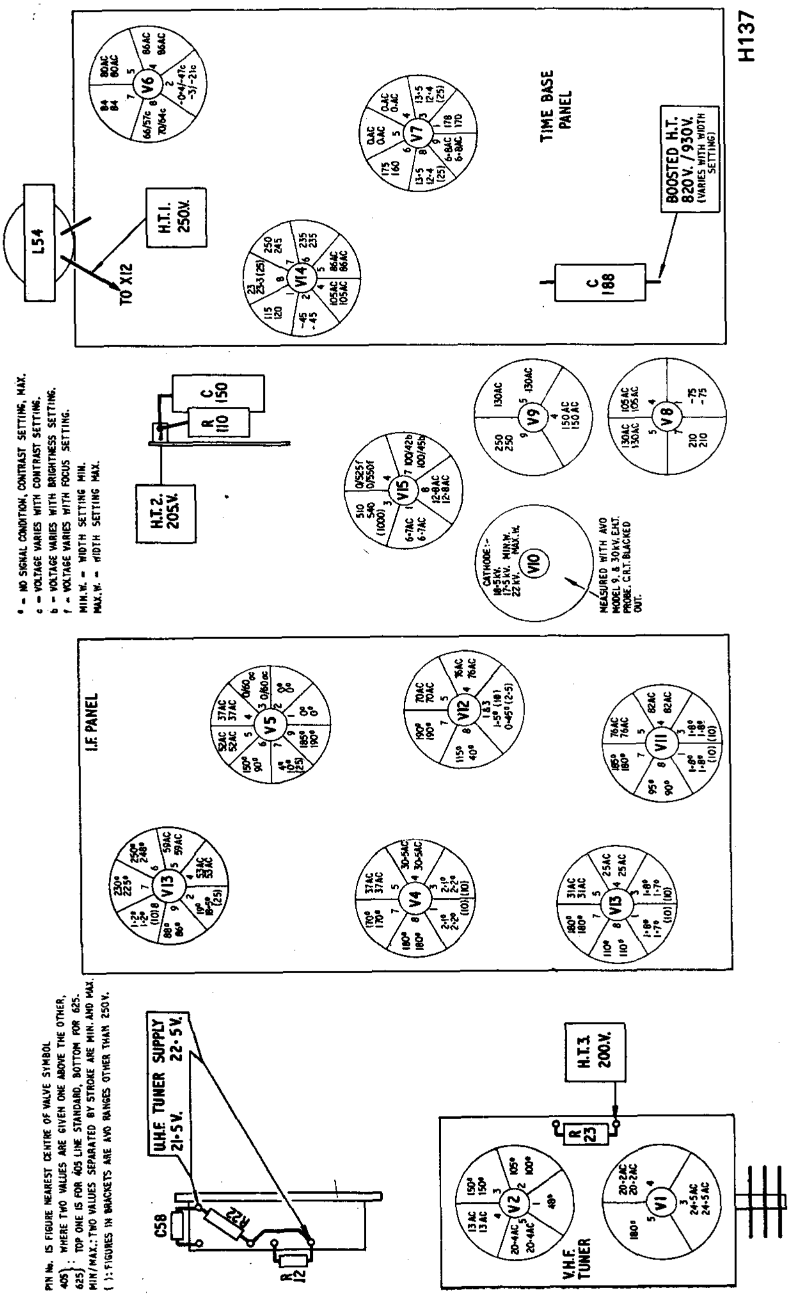


(H132) MAIN CHASSIS LAYOUT—680 SERIES T.V./F.M. RADIO

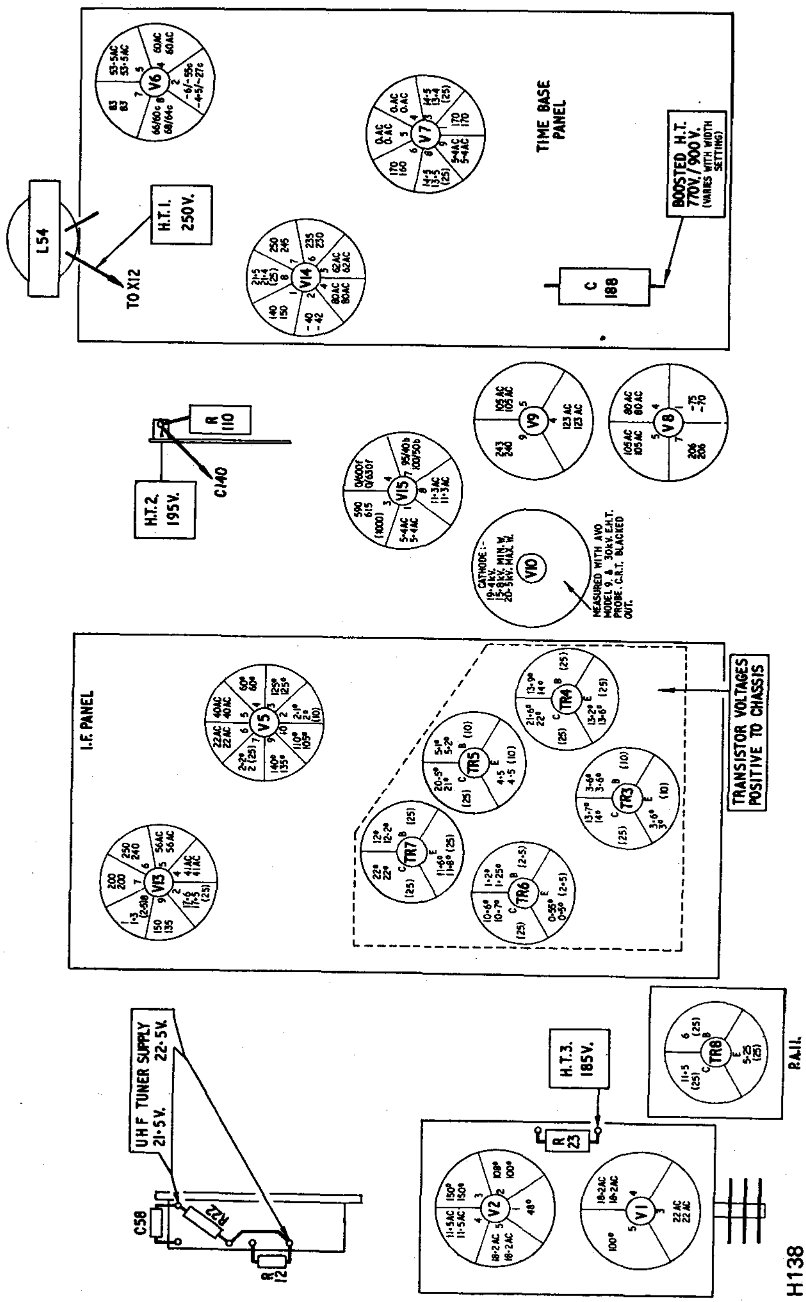


H133

(H133) Main Chassis Layout—660, 670 and 680 Series T.V. Only, and 670 Series T.V./F.M. Radio



(H137) VOLTAGE CHART—RECEIVERS WITH ALL-VALVE I.F. SECTIONS



H138

(H138) Voltage Chart—Receivers With Transistorised I.F. Sections

38. Switch off and disconnect all the test equipment, unless the U.H.F./V.H.F. tuner coupling is to be aligned immediately.

Alignment of Additional Sound I.F. Stage (PA11): This is used in 680 Series T.V./F.M. receivers.

(*a*) *Equipment Required:* Note that if this sub-assembly is to be aligned immediately after stage 13 of the I.F. alignment procedure, no extra equipment is required; start the procedure at stage 2 below.

Sweep frequency generator: Sweep range ±2 MHz, centred on 6 MHz.

Oscilloscope: (Such as Telequipment D43).

Extension leads: For operating the receiver with the tuner assembly removed from the cabinet.

Probe: For injecting signals at the grid of V2b.

(*b*) *Procedure:*

1. Carry out stages 1, 2, 3 and 4 of the procedure for aligning the transistorised I.F. section.
2. Connect the oscilloscope to TP11, and select an F.M. radio channel.
3. Connect the sweep generator to the grid of V2b and set its output at 6 MHz with a sweep of ±2 MHz.
4. Trim L59, L58, L57 and L56, in that order, for the maximum symmetrical response centred on 6 MHz.
5. If only the additional sound I.F. stage is to be aligned, switch off and disconnect all the test equipment. If the whole of the I.F. section is being aligned, resume the procedure at stage 15.

Alignment of U.H.F./V.H.F. Tuner Coupling:

(*a*) *Equipment Required:* Note that if the tuner coupling is to be aligned immediately after the I.F. alignment procedure, no extra equipment is required: start at stage 6 below.

Sweep frequency generator: Sweep range ±6 MHz, centred on 600 MHz, with provision for marker pip injection at 39·5 MHz.

Oscilloscope: (Such as Telequipment D43).

Extension leads: For operating the receiver with the tuner assembly removed from the cabinet.

Low impedance source of D.C. bias: Variable from 0–9 V for receivers with all-valve I.F. sections, variable from 0–25 V for receivers with transistorised I.F. sections.

Trimming tool.

(*b*) *Procedure:*

1. Remove the tuner assembly from the cabinet and connect it to the chassis with the extension leads.
2. Switch on the receiver and allow it to warm up for at least 3 minutes.
3. Turn the contrast and brightness controls to their "minimum" settings.
4. (Receivers with all-valve I.F. sections): Connect the variable bias supply between chassis (positive) and one end of R44 (negative, on the I.F. panel).

(Receivers with transistorised I.F. sections): Connect the variable bias supply between chassis (negative) and TP2 (positive, on the I.F. panel).

5. Calibrate the oscilloscope so that the Y-deflection corresponding to an input signal of 1 V peak-to-peak is known.

6. (Receivers with all-valve I.F. sections): Connect the input lead of the oscilloscope to TP3 (on the I.F. panel).

(Receivers with transistorised I.F. sections): Connect the input lead of the oscilloscope to TP5 (on the I.F. panel).

7. Select a U.H.F. channel.

8. Connect the output lead of the sweep generator to the U.H.F. aerial socket and set it, and the U.H.F. tuner, so that the oscilloscope displays a response curve centred on 600 MHz.

9. Adjust the variable bias supply for maximum gain, and adjust the level of the input signal so that the height of the oscilloscope trace corresponds to 1 V peak-to-peak.

10. Adjust the bias supply to reduce the response by 20 dB, i.e. to reduce the height of the oscilloscope trace to one-tenth of its original value (0·1 V peak-to-peak).

11. Increase the level of the input signal until the height of the oscilloscope trace again corresponds to 1 V peak-to-peak.

12. Superimpose a vision carrier marker at 39·5 MHz on the sweep generator output.

13. Adjust L16 and L8 to obtain a level response with the vision carrier 6 dB $\pm$ 1 dB down the H.F. skirt of the response, as shown in diagram H123.

14. Switch off and disconnect all the test equipment.

A.G.C. Setting (Transistorised I.F. Sections):

(*a*) *Equipment Required:*

Voltmeter: Such as Avometer model 8, and a shorting link.

(*b*) *Procedure:*

1. Remove the back of the cabinet and disconnect the vision I.F. lead from the I.F. panel (P3).

2. Fit a shorting link between chassis and TP8 (on the I.F. panel).

3. Connect the voltmeter, set to read 1 V F.S.D., across R40 (on the I.F. panel).

4. Connect the mains plug (do not connect the aerial plugs), switch on the receiver, and allow 1–1½ minutes for warming up.

5. Adjust the pre-set A.G.C. control (R101) so that the voltmeter indicates 0·5 V.

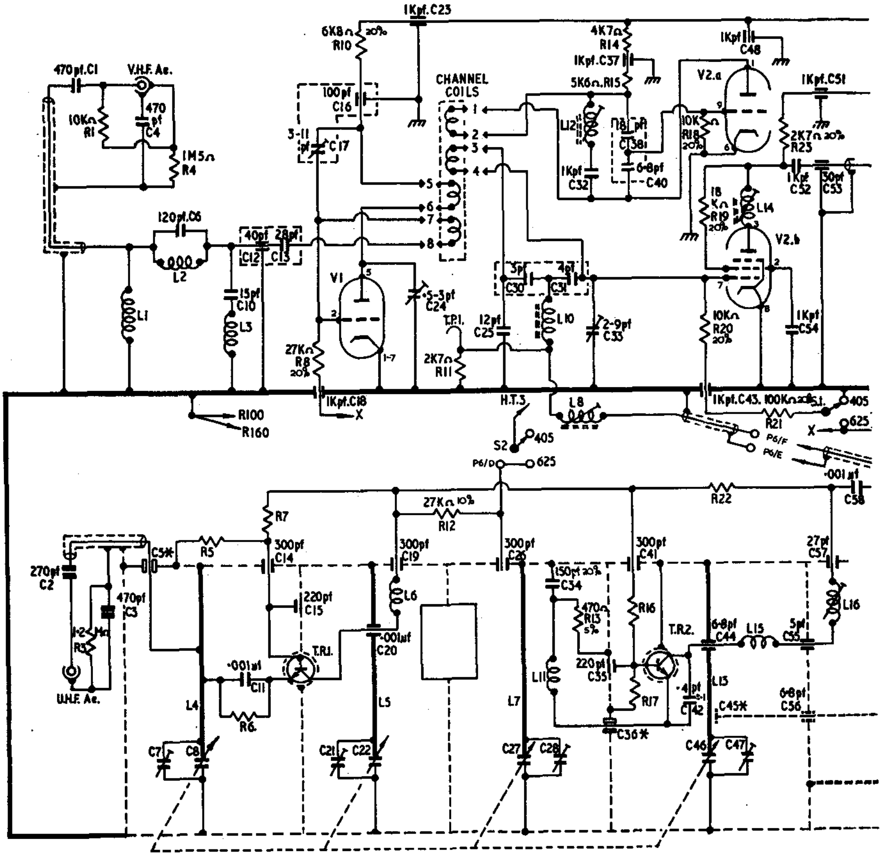
6. Switch off the receiver, disconnect the test equipment, reconnect the vision I.F. lead, and refit the back of the cabinet.

Flywheel Line Oscillator Setting:

(*a*) *Equipment Required:*

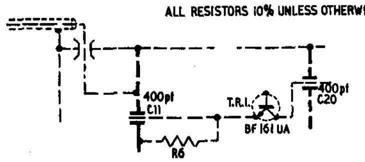
Trimming tools: For adjusting the two cores of the line oscillator cathode coil, L50.

The core nearest the print side of the timebase panel (the "bottom", 405-line, core), requires a screwdriver type tool. The "top", 625-line, core is hexagonal. Both cores can be adjusted from the component side of the panel



✱ C5 & C36 ARE THE CAPACITIES OF THE TWO LEAD THROUGH INSULATORS (LESS THAN 1pf) C45 IS THE COUPLING CAPACITY PROVIDED BY THE PROXIMITY OF THE LINE (L13) & THE WIRE ENDS OF C56.

ALL RESISTORS 10% UNLESS OTHERWISE STATED



SWITCHES

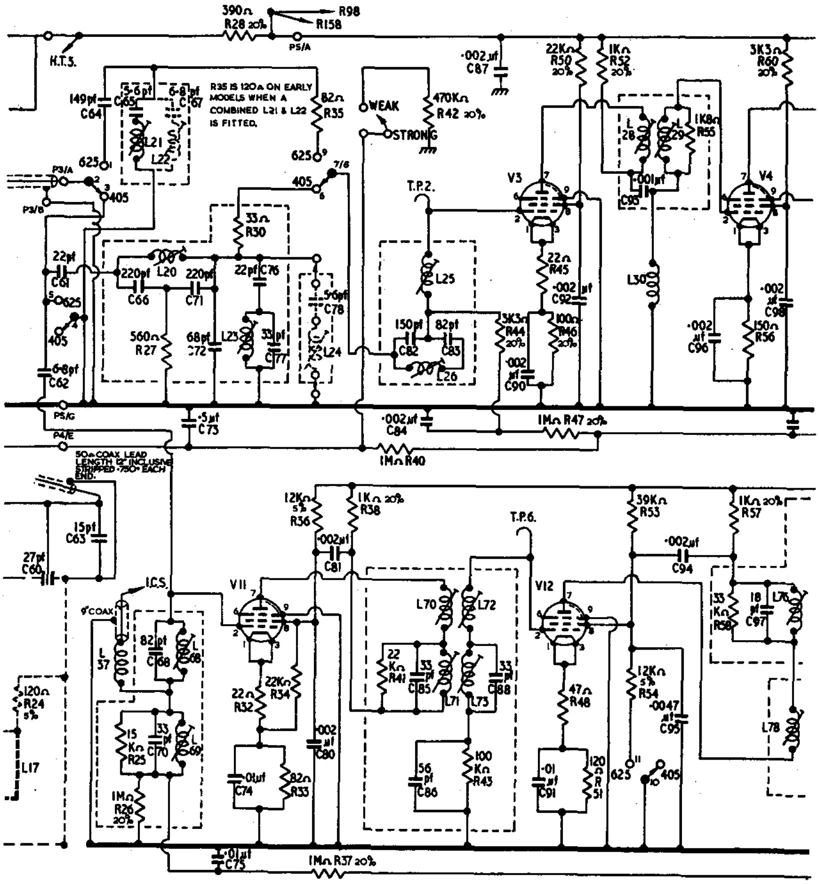
S.1. & S.2. ARE WAFER SWITCHES MOUNTED ON THE TURRET TUNER, S.1. NEAREST TUNER.

SYSTEM SWITCH CONTACTS NUMBERED 1 TO 30 ARE MOUNTED ON THE VISION/SOUND PRINTED CIRCUIT PANEL.

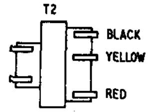
SYSTEM SWITCH CONTACTS LETTERED A TO L ARE MOUNTED ON THE TIME BASE PRINTED CIRCUIT PANEL.

H140a

(H140a) Circuit Diagram—660 Series T.V. Only (All-valve I.F. Section) (Part)



MULLARD/FAIRCHILD U.H.F. TUNER COMPONENT VARIATIONS					
FAIRCHILD		MULLARD	FAIRCHILD		MULLARD
R5	3·3kΩ	2·2kΩ	R17	3·3kΩ	1kΩ
R6	470Ω	1kΩ	R22	470Ω	1·8kΩ
R7	39kΩ	6·8kΩ	TR1	BF161UA	BF180
R16	39kΩ	6·8kΩ	TR2	BF161UB	BF181

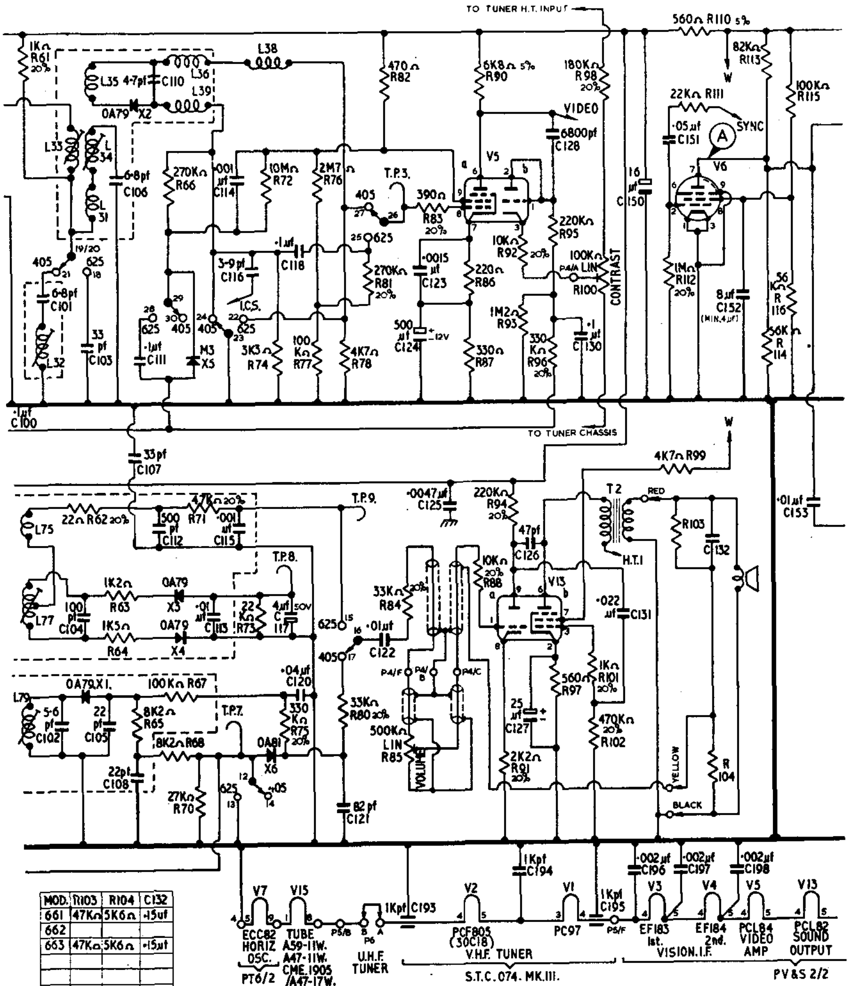


MAINS VOLTAGE ADJUSTMENT LETTERS MARKED ON DROPPER

A.C. MAINS ONLY			
VOLTS	LEADS		
	PURPLE	BROWN	RED
200	C	B	D
210	C	B	D
220	C	B	D
230	C	A	E
240	C	A	E
250	C	A	E

H140b

(H140b) CIRCUIT DIAGRAM—660 SERIES T.V. ONLY (ALL-VALVE I.F. SECTION) (PART)



MOD.	R103	R104	C132
661	47Kᘯ	5K6ᘯ	·15μf
662			
663	47Kᘯ	5K6ᘯ	·15μf

SOCKET CONNECTIONS

P.2.
A – LIVE HORIZONTAL COILS.
B – DEAD " " " TO SWITCH.
C – VERTICAL COIL TO CHASSIS.
D – LIVE VERTICAL COIL.

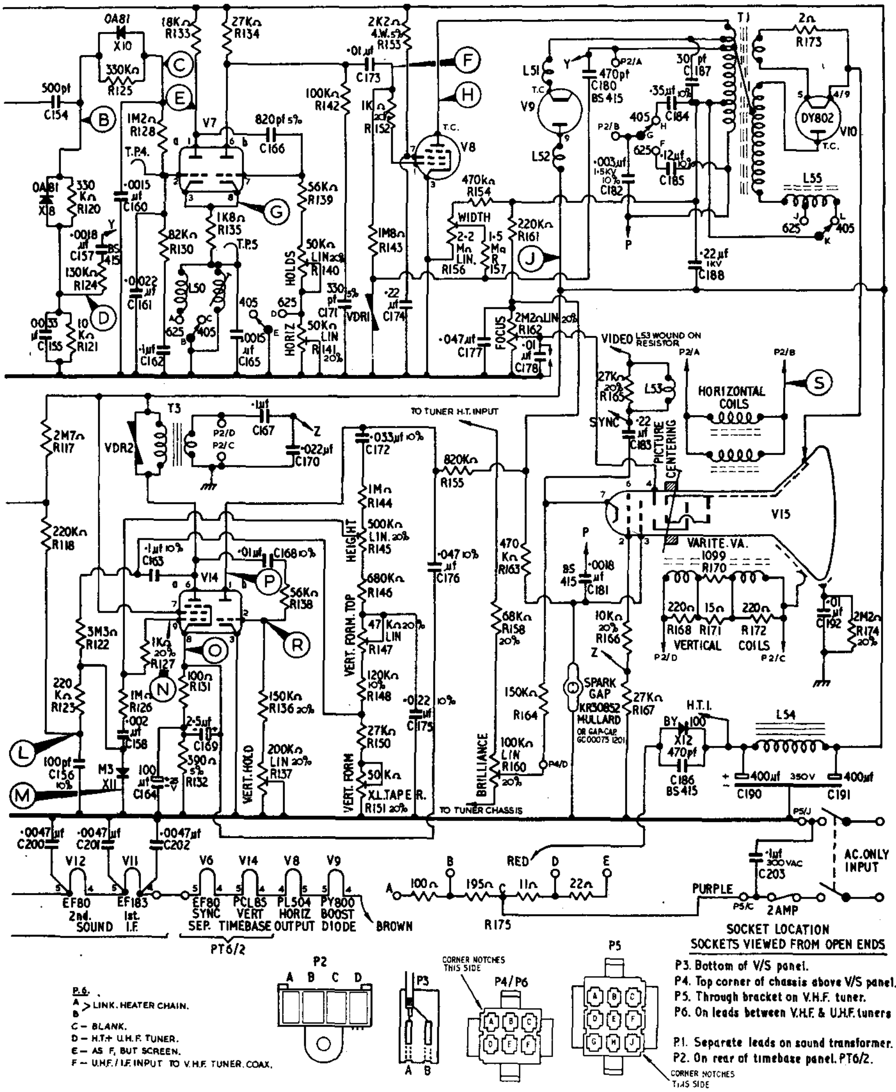
P.3.
A – V.H.F. TUNER I.F. OUT. COAX.
B – " " " " SCREEN.

P.4.
A – R92 TO CONTRAST CONTROL.
B – R104, R103 TO VOLUME CONTROL.
C – R88 TO VOLUME CONTROL.
D – R164 TO BRILLIANCE CONTROL.
E – RF. AGC. FROM V.H.F. TUNER.
F – R84 TO VOLUME CONTROL.

P.5.
A – H.T. TO TUNER UNIT.
B – U.H.F. TUNER TO C.R.T. HEATER CHAIN.
C – 2 AMP FUSE TO MAINS DROPPER. PURPLE.
D – BLANK.
E – BLANK.
F – V.H.F. TUNER/PV & S2/2. HEATER CHAIN.
G – U.H.F. TUNER CHASSIS TO MAIN CHASSIS.
H – BLANK.
J – ON OFF SWITCH TO CHASSIS.

H140c

(H140c) Circuit diagram—660 Series T.V. Only (All-valve I.F. Section) (Part)

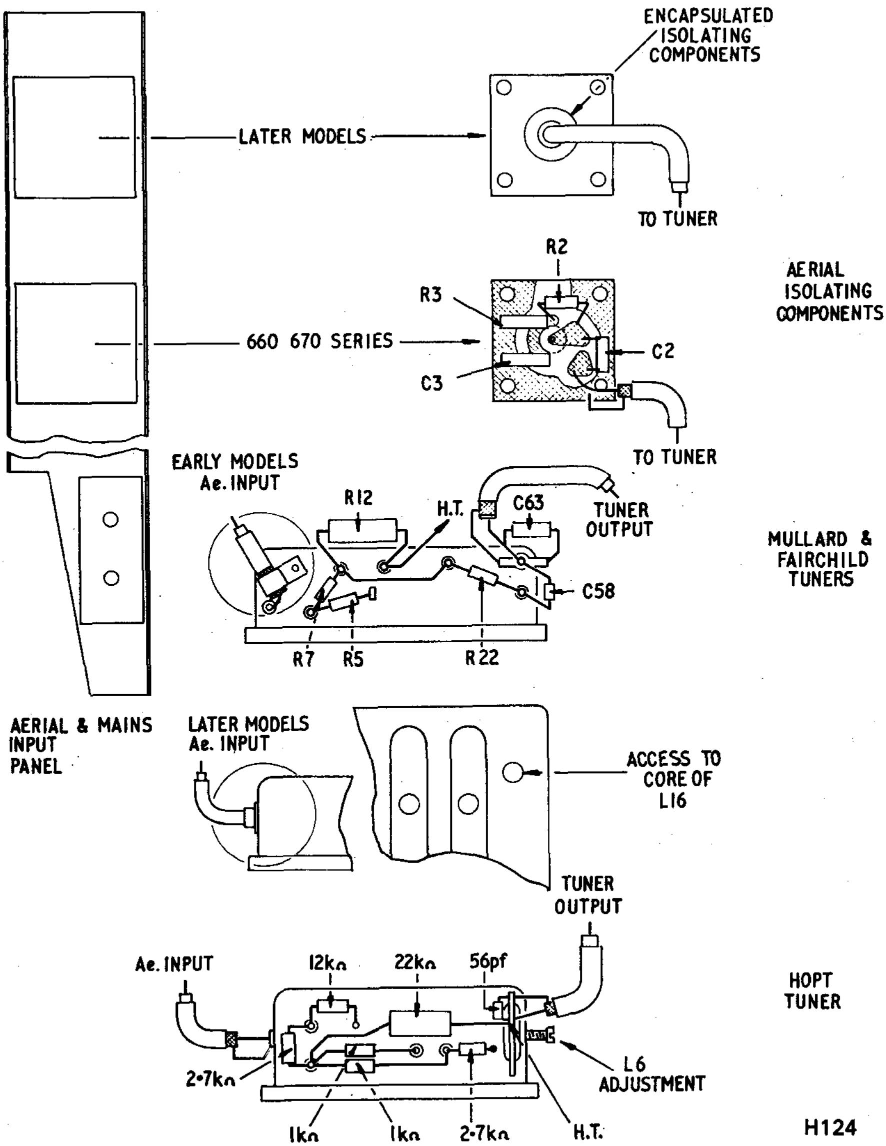


H140d

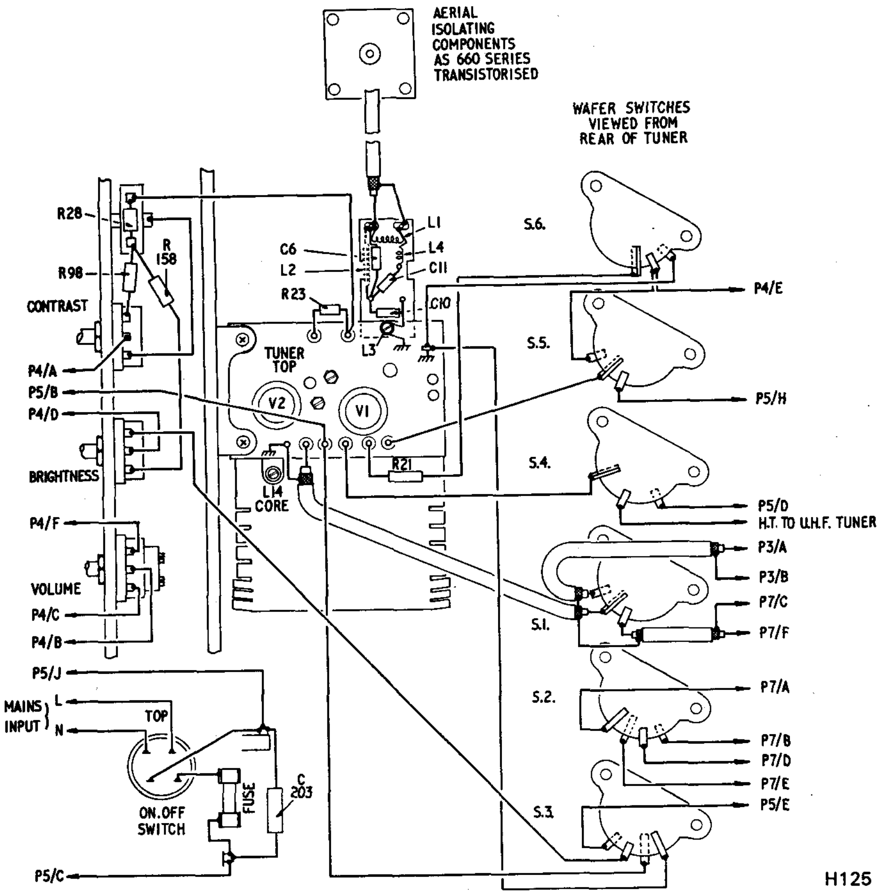
(H140d) Circuit Diagram—660 Series T.V. Only (All-valve I.F. Section) (Continued)

if the screwdriver tool can be inserted through the hexagonal tool. Otherwise the chassis must be put in the servicing position.

Shorting links: Two required.



(H124) U.H.F. Tuner and Aerial Panel—660, 670 and 680 Series



(H125) V.H.F. Tuner and Aerial Panel—680 Series T.V./F.M. Radio Receivers

(*b*) *Procedure:*

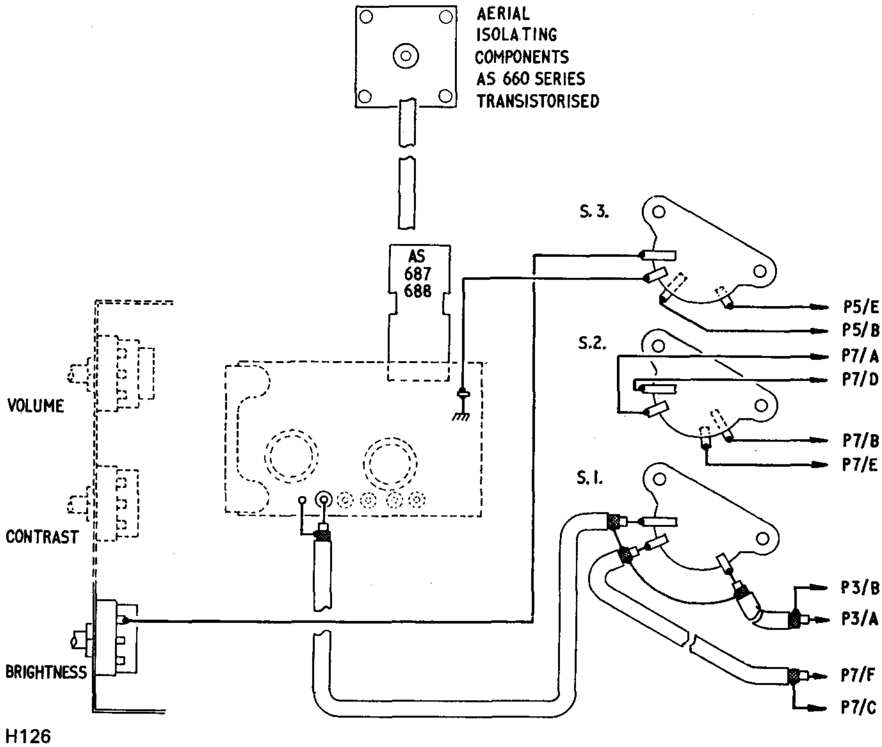
1. Remove the back of the cabinet and put the chassis in the servicing position if necessary.

2. Connect the aerial and mains plugs, switch on the receiver, and allow 1–1½ minutes for warming up.

3. (Receivers with all-valve I.F. sections): Fit a shorting link across the pins of TP4 and across the pins of TP5.

(Receivers with transistorised I.F. sections): Fit a shorting link across the pins of TP6 and across the pins of TP7.

4. Select a 625-line channel and adjust the user line hold control (R140) to obtain a single floating picture.



(H126) V.H.F. Tuner and Aerial Panel—670 Series T.V./F.M. Radio Receivers

5. Select a 405-line channel and adjust the pre-set line hold control (R141) to obtain a single floating picture.

6. Remove the shorting link from the bottom pair of pins (TP5, receivers with all-valve I.F. sections; TP7, all other receivers), and adjust the core of L50 to maintain the single floating picture.

7. Select a 625-line channel and adjust the top core of L50 to maintain the single floating picture.

8. Select a 405-line channel and make sure the single floating picture is still maintained. If necessary, re-adjust the bottom core of L50.

9. Select a 625-line channel and make sure a single floating picture is still maintained. If necessary, re-adjust the top core of L50.

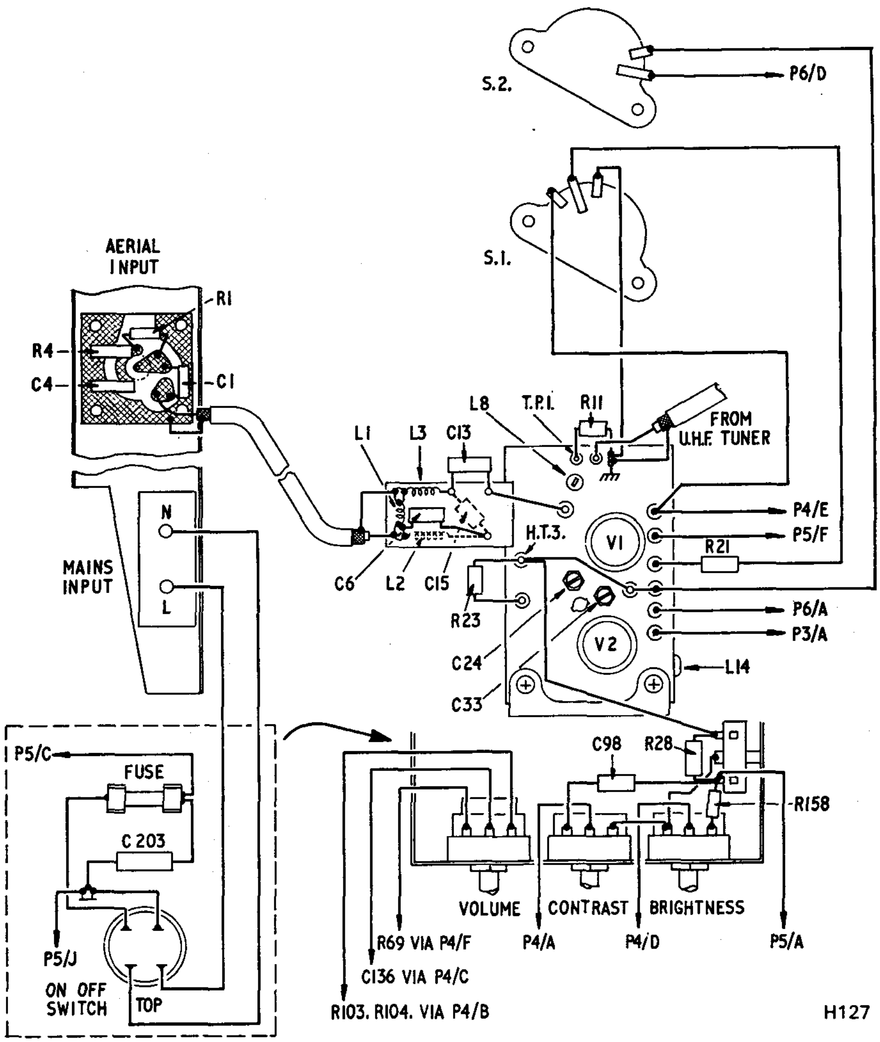
10. Remove the other shorting link and check that the picture locks on both 405- and 625-line standards.

11. Switch off and refit the back of the receiver.

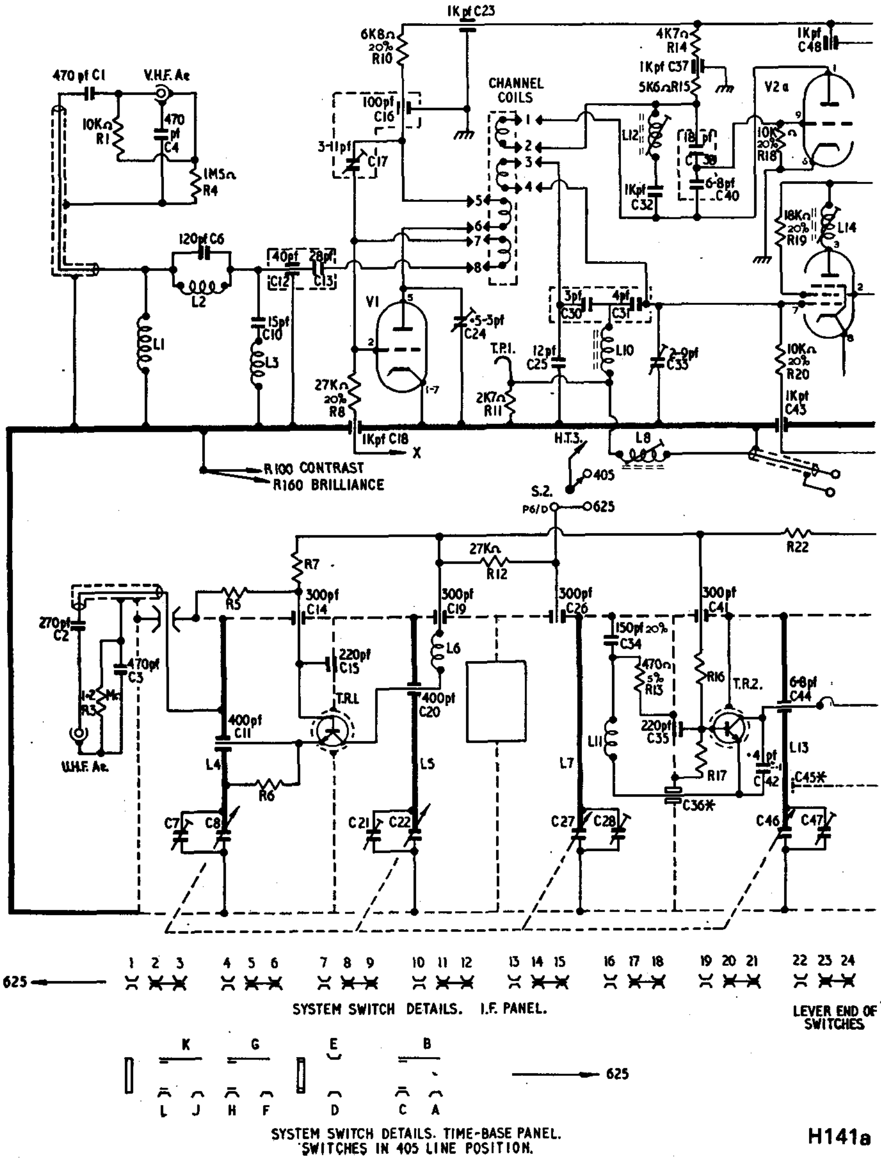
Voltage Chart (Receivers With All-valve I.F. Sections): Except where stated otherwise, voltages are measured with model 8 Avometer set on 250V

range. The receiver reproduces a normal locked picture received with a signal strength of about 1 mV.

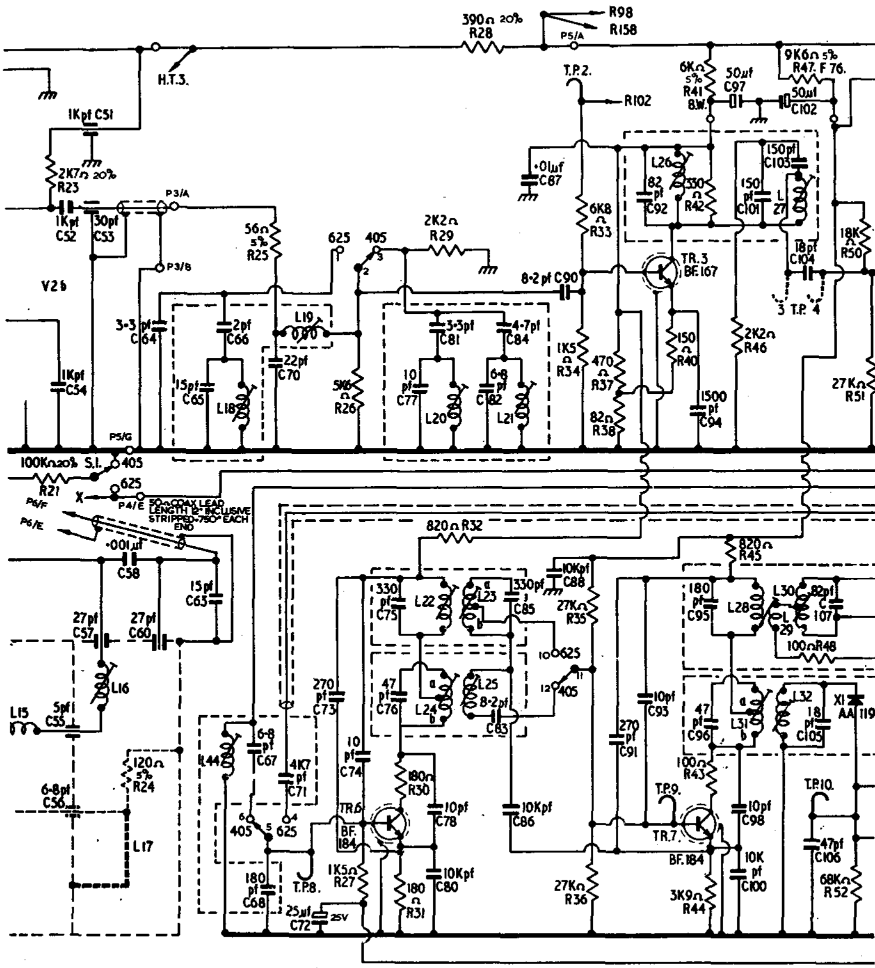
Voltage Chart (Receivers With Transistorised I.F. Sections): For measurement conditions see under the heading Voltage Chart (Receivers With All-valve I.F. Sections).



(H127) V.H.F. TUNER AND AERIAL PANEL—T.V. ONLY MODELS



(H141a) CIRCUIT DIAGRAM—660, 670 AND 680 SERIES T.V. ONLY (PART)



MULLARD/FAIRCHILD U.H.F. TUNER COMPONENT VARIATION					
FAIRCHILD		MULLARD	FAIRCHILD		MULLARD
R5	3·3kΩ	2·2kΩ	R17	3·3kΩ	1kΩ
R6	470Ω	1kΩ	R22	470Ω	1·8kΩ
R7	39kΩ	6·8kΩ	TR1	BF161UA	BF180
R16	39kΩ	6·8kΩ	TR2	BF161UB	BF181

CORES			
GRADE	SIZE	USED IN	QTY
500	6MM	L28, L29, L30	2
900	6MM	L34	1
500	4MM	L22, L23, L40, L41	3
900	4MM	REST	15

SWITCHES

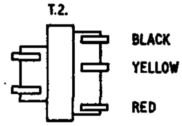
S.1. & S.2. ARE WAFER SWITCHES MOUNTED ON THE TURRET TUNER. S.1. NEAREST TUNER.

SYSTEM SWITCH CONTACTS NUMBERED 1 TO 24 ARE MOUNTED ON THE VISION/SOUND PRINTED CIRCUIT PANEL.

SYSTEM SWITCH CONTACTS LETTERED A TO L ARE MOUNTED ON THE TIME BASE PRINTED CIRCUIT PANEL.

* C36 IS THE CAPACITY OF THE LEAD THROUGH INSULATOR (LESS THAN 1pf).
C45 IS THE COUPLING CAPACITY PROVIDED BY THE PROXIMITY OF THE LINE (L13) & THE WIRE ENDS OF C56.

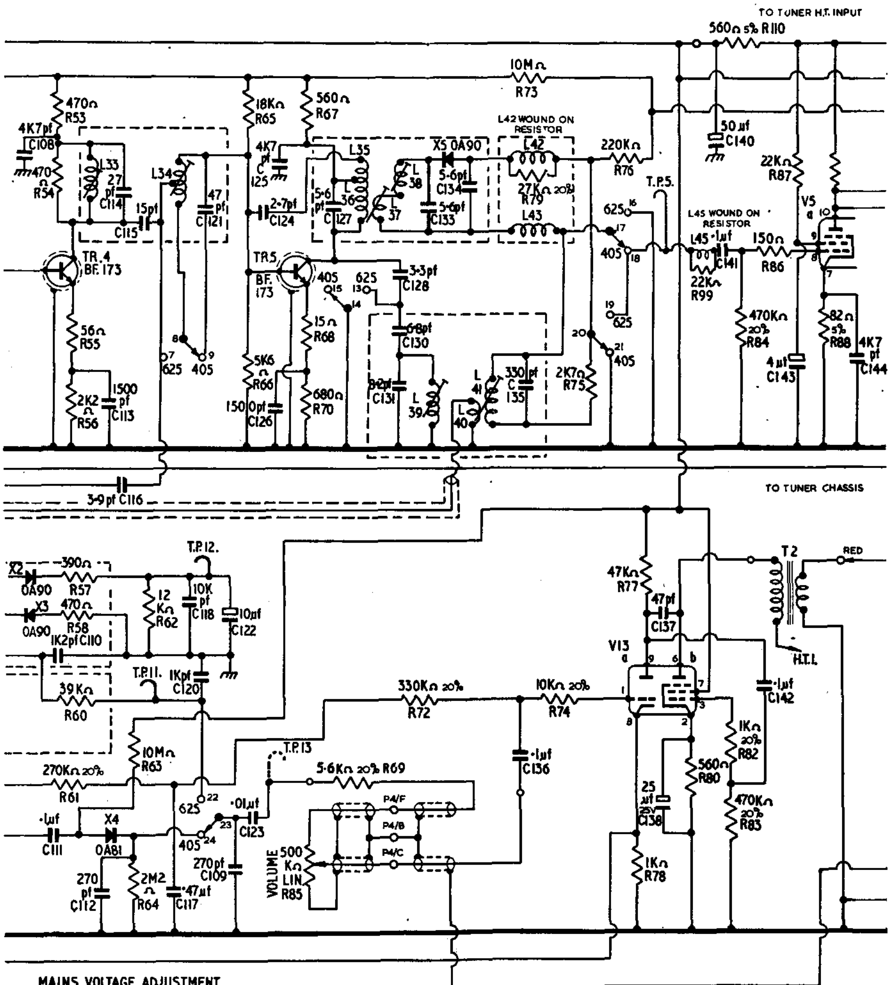
T.2.



H141b

ALL RESISTORS 10% UNLESS OTHERWISE STATED

(H141b) Circuit Diagram—660, 670 and 680 Series T.V. Only (Part)



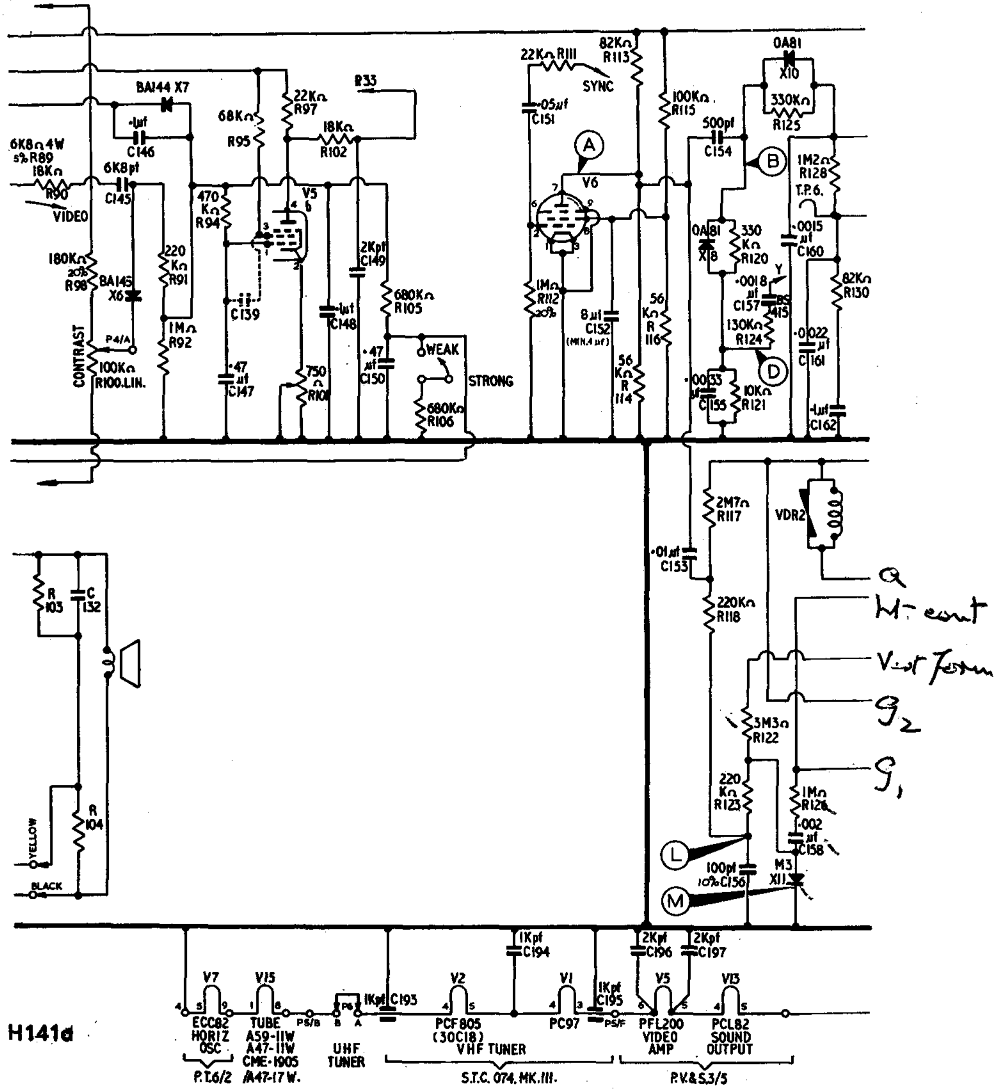
H141c

MAINS VOLTAGE ADJUSTMENT LETTERS MARKED ON DROPPER

A.C MAINS ONLY			
VOLTS	LEADS		
	PURPLE	BROWN	RED
200	C	B	D
210	C	B	D
220	C	B	D
230	C	A	E
240	C	A	E
250	C	A	E

MOD	R103	R104	C132
661	47KΩ	5K6Ω	·15μf
662			
663	47KΩ	5K6Ω	·15μf
664	47KΩ	5K6Ω	·15μf
665	YELLOW & RED JOINED. R103, R104 C132 OMITTED		

(H141c) Circuit Diagram—660, 670 and 680 Series T.V. Only (Part)



SOCKET CONNECTIONS

P2.
A – LIVE HORIZONTAL COILS
B – DEAD HORIZONTAL COILS TO SWITCH.
C – VERTICAL COIL TO CHASSIS.
D – LIVE VERTICAL COIL.

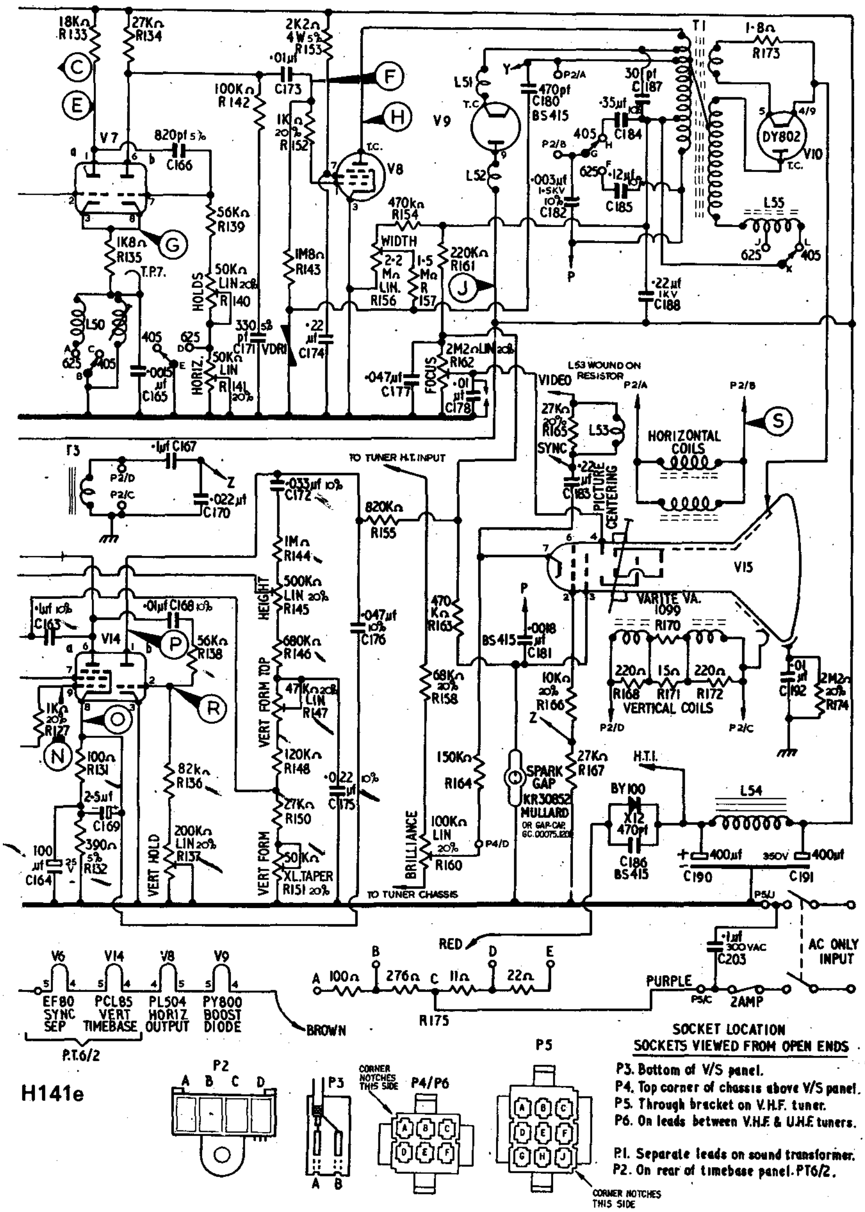
P3.
A – V.H.F. TUNER. I.F. OUT. COAX.
B – V.H.F. TUNER. I.F. OUT. SCREEN.

P4.
A – X6. TO CONTRAST CONTROL.
B – R103, R104 TO VOLUME CONTROL.
C – C136 TO VOLUME CONTROL
D – R164. TO BRILLIANCE CONTROL.
E – RE A.G.C. FROM V.H.F. TUNER.
F – R69 TO VOLUME CONTROL.

P5.
A – H.T. TO TUNER UNIT.
B – U.H.F. TUNER, TO C.R.T. HEATER CHAIN.
C – 2 AMP FUSE TO MAINS DROPPER, PURPLE.
D – BLANK.
E – BLANK.
F – V.H.F. TUNER/PV&S3/5. HEATER CHAIN.
G – U.H.F. TUNER CHASSIS, TO MAIN CHASSIS.
H – BLANK.
J – ON.OFF SWITCH TO CHASSIS.

P6.
A, B – LINK. HEATER CHAIN.
C – BLANK.
D – H.T.+ U.H.F. TUNER.
E – AS F. BUT SCREEN.
F – U.H.F./I.F. INPUT TO V.H.F. TUNER COAX.

(H141d) CIRCUIT DIAGRAM—660, 670 AND 680 SERIES T.V. ONLY (PART)



(H141e) Circuit Diagram—660, 670 and 680 Series T.V. Only (Continued)

Circuit Description—V.H.F. Tuners (T.V. Only Models): The input coil of the tuner is one of the four on the channel biscuit in use, and its terminations are numbered 7 and 8 on the circuit diagrams.

From the V.H.F. aerial socket, signals pass to terminal 8 of the coil via the isolating components C1 and C4 and the filter circuits L1, L2/C6, L3/C10, C12 and 13. The filter L3/C10 can be tuned to reject any interfering signals in the I.F. band. Resistors R1 and R4 provide a path for the discharge of static from the aerial. A.G.C. from the I.F. section, and the output from terminal 7 of the input coil, are fed to the grid of V1.

The anode load of V1 is another coil on the biscuit (terminations 5 and 6), and this coil is tuned by C24. Termination 5 of the coil is decoupled by C16 whose value is sufficiently low for a small proportion of the signal to appear across it. This voltage, which is at input signal frequency, is applied via C17 to the grid of V1, and H.T. is supplied to the anode of V1 via R10, C17 is set to give optimum neutralisation.

The oscillator is of the Colpitts type and employs the triode section of V2; the oscillator coil is on the channel biscuit (terminations 1 and 2).

H.T. is fed to the anode of V2a via R14 and R15, and C37 decouples the junction of these two resistors.

C38 and C40 are wired across the tuned circuit and the grid of V2a is connected to their junction. R18 is the grid resistor. Fine tuning is achieved by varying L12; the adjustable core of this coil is operated by a cam on the fine tuner spindle. C32 prevents H.T. from being applied to the anode of V2a when no channel biscuit is in position, and when the receiver is operating on U.H.F.

The remaining coil on the biscuit (terminations 3 and 4) is coupled to the grid of the mixer (V2b), and tuned by C33 and C25.

On 405-line operation, R20 and R21 are connected to chassis by S1.

On 625-line operation, A.G.C. is applied to the grid of V2b via R20 and R21.

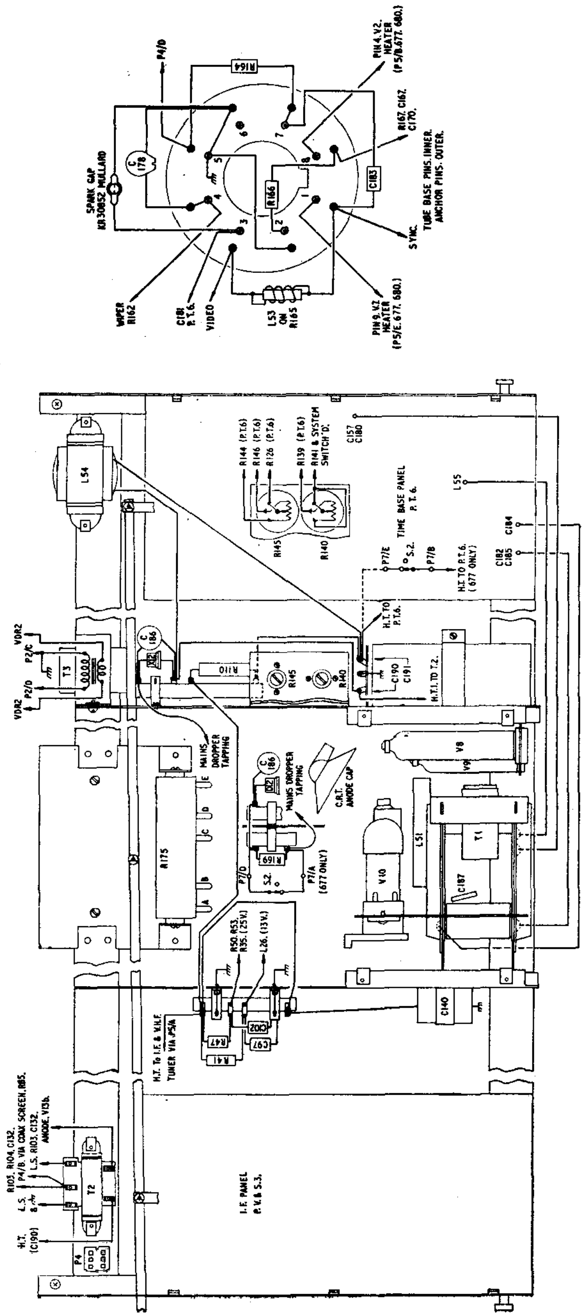
H.T. is fed to the anode of V2b via R23 and L14, which is the I.F. output coil. R19 is the screen grid feed resistor and C54 the screen grid by-pass capacitor. The output from the tuner is taken to the I.F. section via C52, C53 and a length of coaxial cable.

The H.T. line of the tuner is decoupled by C23, C48 and C51, and the heaters are decoupled by C193, C194 and C195.

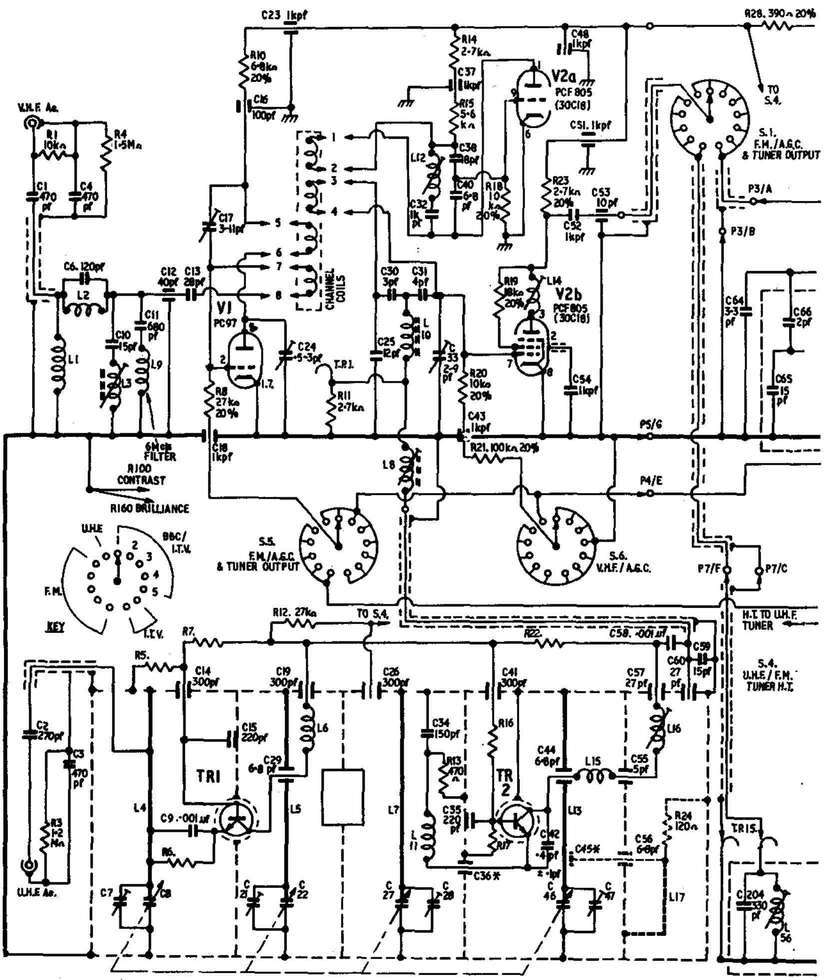
On U.H.F. operation, I.F. signals are fed into the tuner via the bandpass pair of coils L16 (in the U.H.F. tuner) and L8. The bridge circuit consisting of L10, C30 and C31 reduce I.F. radiation from the tuner, and the signals pass to the grid of V2b. There is no biscuit in the U.H.F. position of the channel selector, and so the oscillator coil of V2a is absent and there is no H.T. supply to the anode of this valve. V2b therefore operates as an I.F. amplifier.

Circuit Description—V.H.F. Tuners (670 Series T.V./F.M. Radio Models): This circuit is similar to the one shown on the 660, 670 and 680 Series T.V. only circuit diagram, with the following exceptions:

1. A 6MHz filter (L4) is included in the input to the aerial channel coil.



(H134) Main Chassis Layout—660 Series T.V. Only (All-valve I.F. Section)



SWITCHES

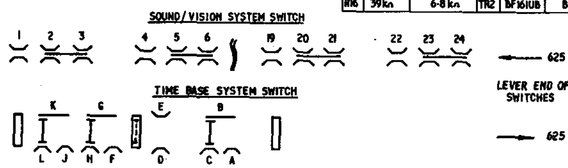
S1. S2. S3. S4. S5. S6. ARE WAFER SWITCHES MOUNTED AT REAR OF V.H.F. TUNER. S1. NEAREST TUNER.

SYSTEM SWITCH CONTACTS NUMBERED 1 TO 24 ARE MOUNTED ON THE VISION/SOUND PANEL.

SYSTEM SWITCH CONTACTS LETTERED A TO L ARE MOUNTED ON THE TIME BASE PANEL.

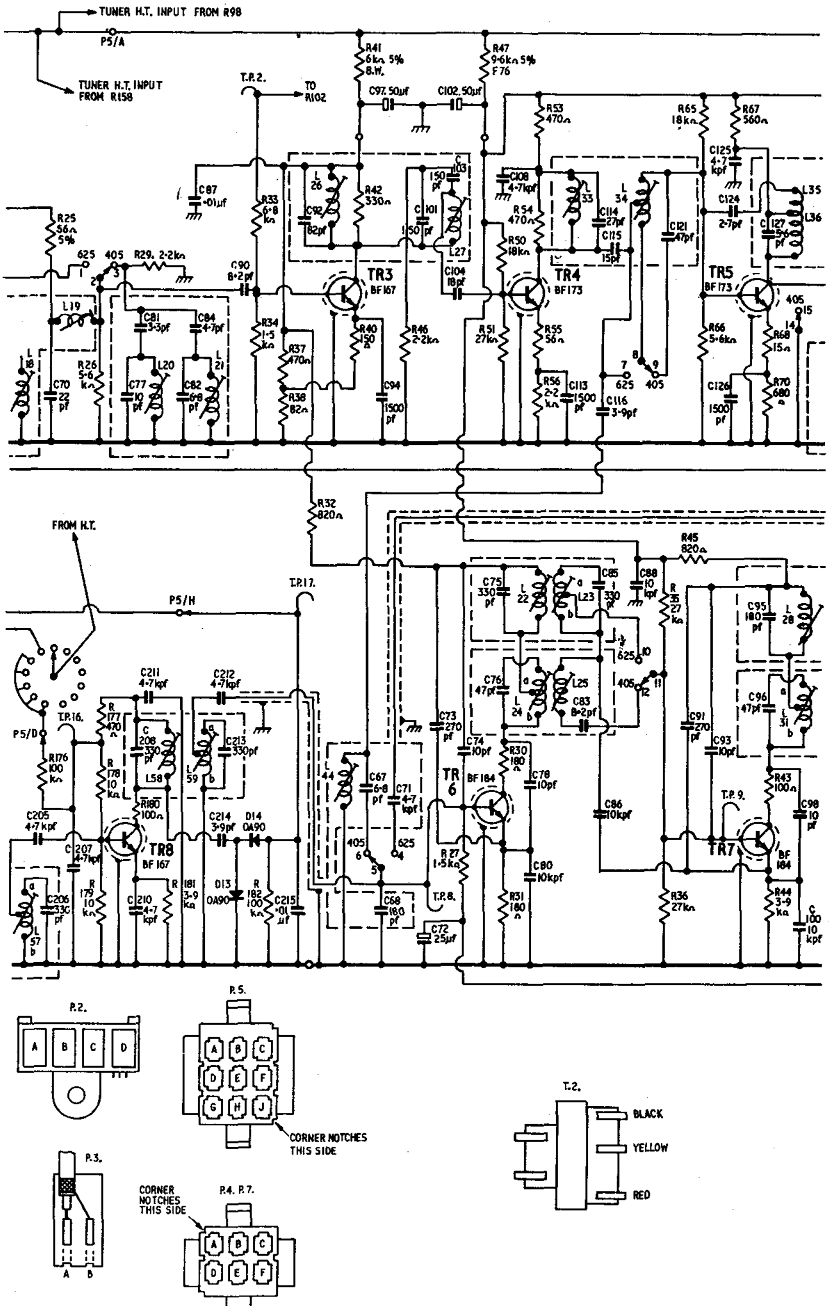
* C36 & C45 ARE LEAD THROUGH INSULATORS THE CAPACITY OF WHICH IS LESS THAN 1pf.

MULLARD/FAIRCHILD U.H.F. TUNER COMPONENT VARIATIONS.					
	FAIRCHILD	MULLARD		FAIRCHILD	MULLARD
R5	3·3kΩ	2·2kΩ	R17	3·3kΩ	1kΩ
R6	470Ω	1kΩ	R22	470Ω	1·8kΩ
R7	39kΩ	6·8kΩ	TR1	BF161UA	BF180
R16	39kΩ	6·8kΩ	TR2	BF161UB	BF181



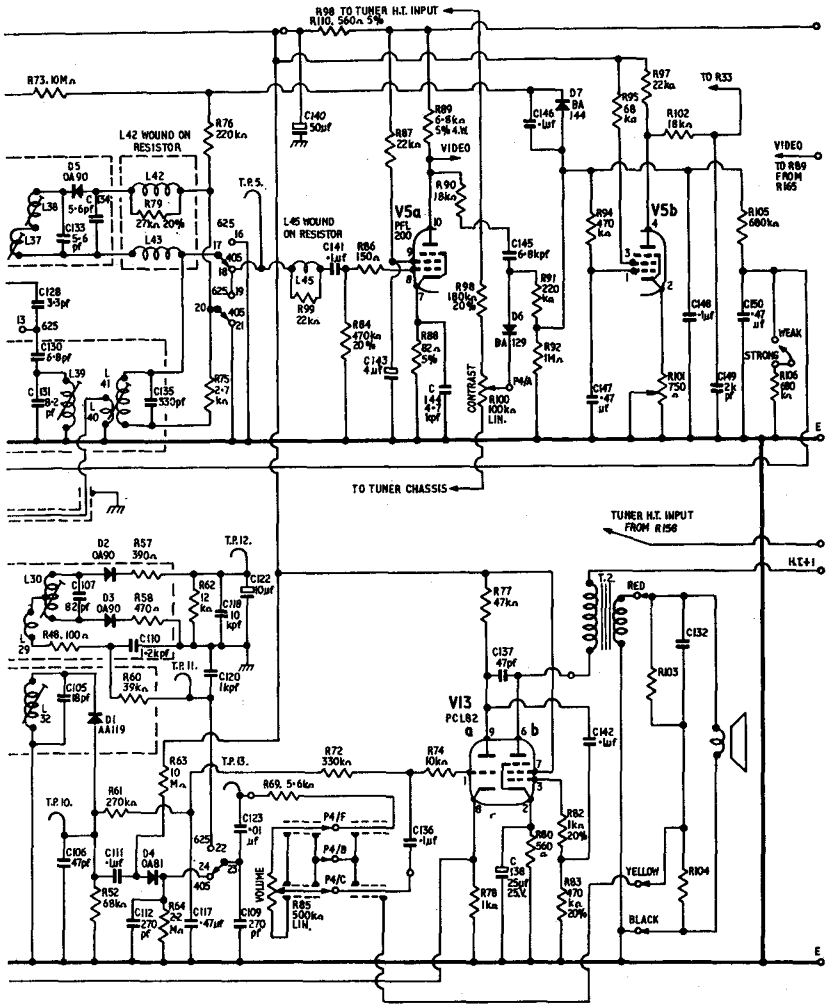
H145a

(H145a) CIRCUIT DIAGRAM—680 SERIES T.V./F.M. RADIO (PART)



H145b

(H145b) Circuit Diagram—680 Series T.V./F.M. Radio (Part)



SOCKET LOCATION

SOCKETS VIEWED FROM OPEN ENDS

P.1. SEPARATE LEADS ON SOUND TRANSFORMER (T.2.)
P.2. ON REAR OF TIME BASE PANEL (P.T.6.)
P.3. BOTTOM OF VISION/SOUND PANEL (P.V.S.3.)
P.4. TOP CORNER OF CHASSIS ABOVE V/S.PANEL.
P.5. THROUGH BRACKET ON V.H.F. TUNER.
P.7. THROUGH BRACKET ON V.H.F. TUNER.

SOCKET CONNECTIONS

P.2.
A. LIVE HORIZONTAL COILS.
B. DEAD HORIZONTAL COILS TO SWITCH 'G'.
C. VERTICAL COIL TO CHASSIS.
D. LIVE VERTICAL COIL.

P.3.
A. V.H.F. TUNER OUT FROM S.1. COAX.
B. V.H.F. TUNER OUT FROM S.1. SCREEN.

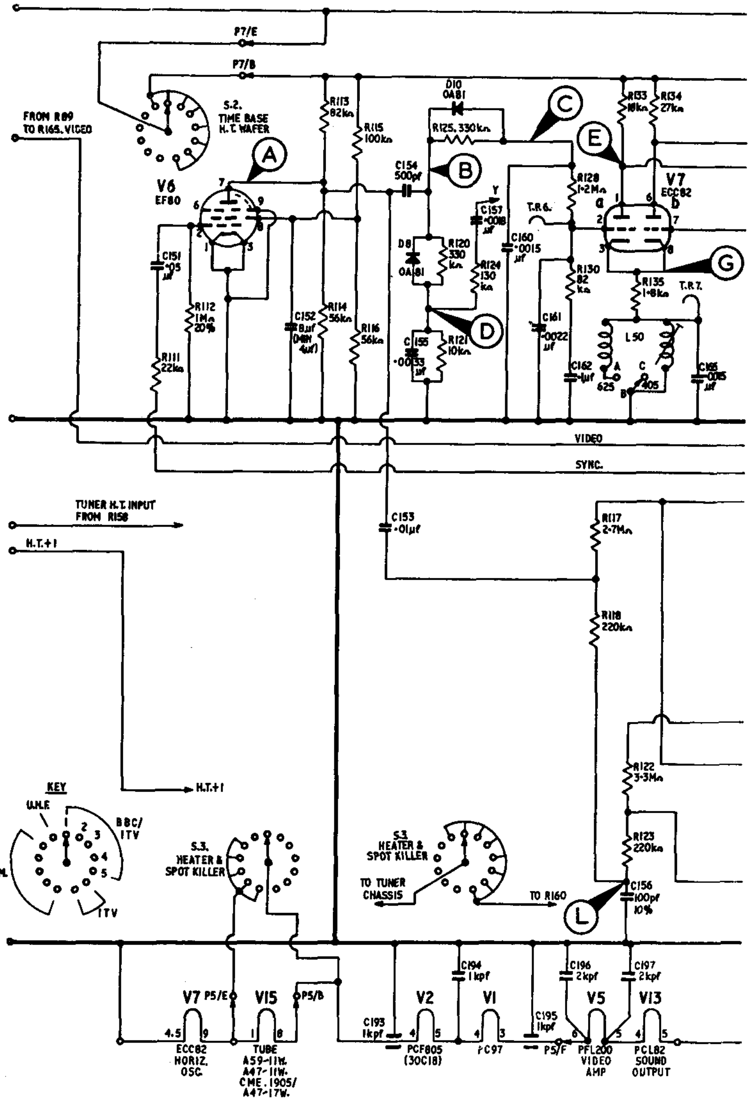
P.4.
A. D.6. TO CONTRAST CONTROL (R100).
B. VOLUME CONTROL TO P.V.S.3. SCREEN.
C. VOLUME CONTROL (R85) TO C136.
D. R164 TO BRILLIANCE CONTROL (R160).
E. R.F. A.G.C. FROM V.H.F. TUNER.
F. VOLUME CONTROL (R85) TO R69.

P.5.
A. H.T. TO TUNER UNIT.
B. S.3. TO C.R.T. HEATER CHAIN.
C. 2 AMP. FUSE TO MAINS DROPPER (R175).
D. S.4. TO R176 ON PRE AMP. (P.A.11).
E. S.3. TO C.R.T. V.7. HEATER CHAIN.
F. V.H.F. TUNER/P.V & S.3./HEATER CHAIN.
G. V.H.F. TUNER CHASSIS TO MAIN CHASSIS.
H. S.5. TO C215. R182 ON PRE AMP. (P.A.11).
J. ON. OFF SWITCH TO CHASSIS.

P.7.
A. S.2. TO R169
B. S.2. TO H.T.
C. SOUND TAKE OFF. SCREEN.
D. S.2. TO R169. C186.
E. S.2. TO H.T.
F. SOUND TAKE OFF. COAX.

H145c

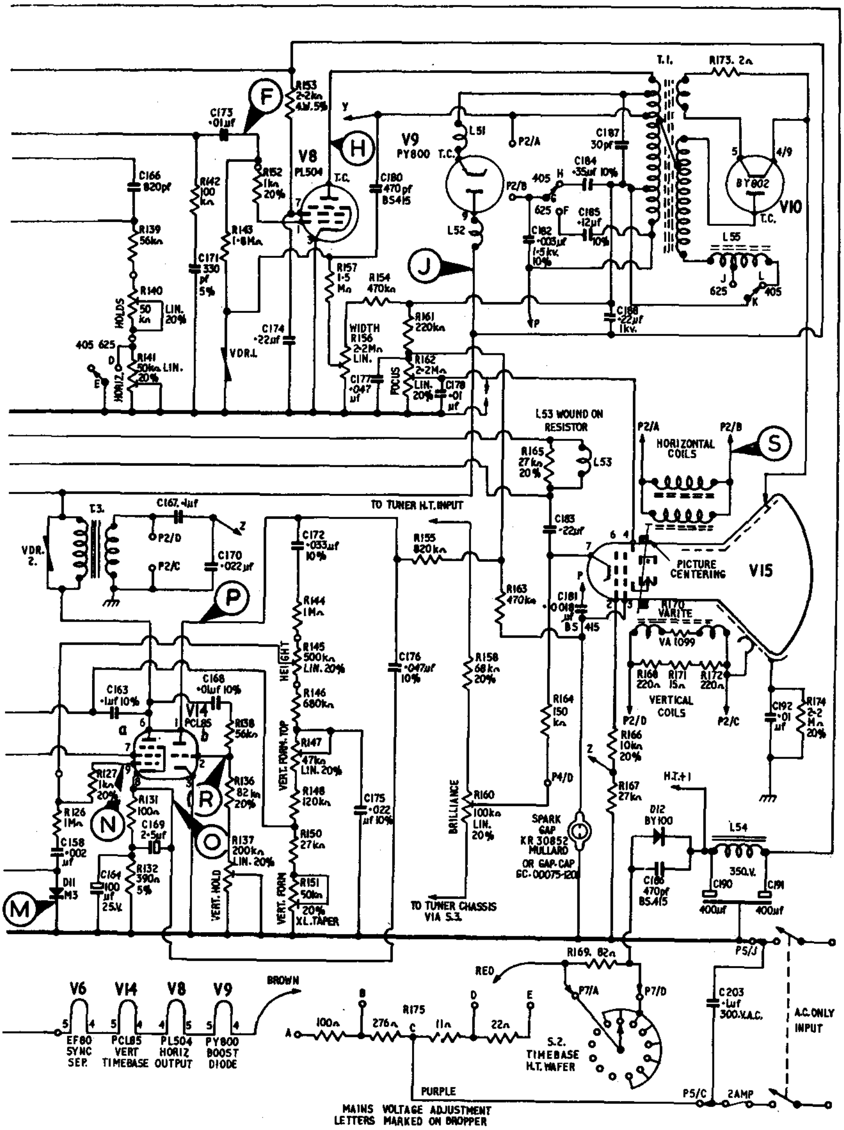
(H145c) CIRCUIT DIAGRAM—680 SERIES T.V./F.M. RADIO (PART)



MOD.	R103	R104	C132
681	47kΩ	5·6kΩ	·15μf
682			
683	47kΩ	5·6kΩ	·15μf
685	47kΩ	5·6kΩ	·15μf
687	47kΩ	5·6kΩ	·15μf
688	47kΩ	5·6kΩ	·15μf

H145d

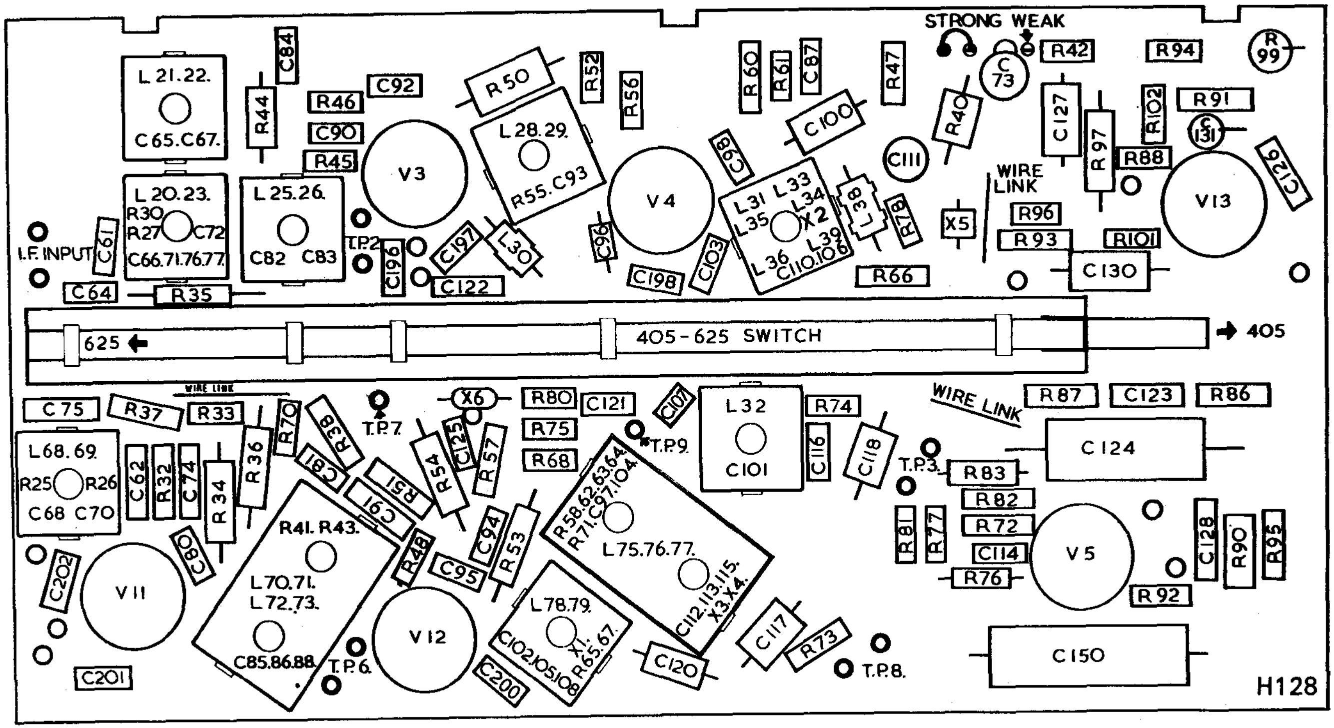
(H145d) Circuit Diagram—680 Series T.V./F.M. Radio (Part)



A.C. MAINS ONLY			
VOLTS	LEADS		
	PURPLE	BROWN	RED
200	C	B	D
210	C	B	D
220	C	B	D
230	C	A	E
240	C	A	E
250	C	A	E

H145e

(H145e) Circuit Diagram—680 Series T.V./F.M. Radio (Continued)



(H128) Component Locations—All valve I.F. Panel (PVS/2)

2. Because there is no U.H.F. tuner, R11, L8, L10 and the HT3 connection to the system switch are absent.

3. There is no change in the application of A.G.C. when switching between 405- and 625-line operation, i.e. S1 shown on the 660, 670 and 680 Series T.V. only circuit diagram is absent. The "earthy" side of R21 is permanently connected to chassis and A.G.C. is always applied only to the grid of V1.

Circuit Description—V.H.F. Tuners (680 Series T.V./F.M. Radio Models): This circuit is similar to the one shown on the 660, 670 and 680 Series T.V. only circuit diagram, with the following exceptions:

1. A 6MHz filter (L9) is included in the input to the aerial channel coil.

2. The application of A.G.C. to the tuner is different when switching between V.H.F., U.H.F. and F.M. radio:

On V.H.F., the "earthy" end of R21 is connected to chassis and A.G.C. from the vision I.F. section is applied only to the grid of V1.

On U.H.F., A.G.C. from the vision I.F. section is applied both to the grid of V1 and to the grid of V2b.

On F.M. radio, A.G.C. from the additional sound I.F. stage is applied to the grid of V1 only.

3. On F.M. radio operation, the output of the tuner is fed to the additional sound I.F. stage instead of to the first vision I.F. stage.

Circuit Description—U.H.F. Tuners: *Note:* Receivers may be fitted with either "Mullard", "Fairchild" or "Hopt" tuners. The circuits of the first two of these types are similar, except for changes in component values, as shown in the table on the circuit diagrams.

The circuit of the "Hopt" tuner is simpler than that of the other types, and is not included in this description. Instead, a separate circuit is shown in diagram H139.

The description below applies to tuners with either Mullard or Fairchild transistors.

Signals are passed from the U.H.F. aerial socket, via the isolating capacitors C2 and C3 and a short length of low-loss cable, to the input tuned line L4. R2 and R3 (R3 only on some receivers), provide a path for the discharge of static from the aerial.

The input is tapped down L4 which is tuned by C8 and trimmed by C7. C11 (C9, 680 Series T.V./F.M. radio models) couples L4 to the emitter of Tr1 which is a common-base amplifier.

Base bias is obtained from the junction of R5 and R7, and R.F. is earthed by C15. R5 and R7 are mounted outside the tuner, and the lead which connects their junction to the base of Tr1 is decoupled by C14 where it passes through the tuner case. The collector output of Tr1 is tapped down L5 and coupled to it by C20 (C29, 680 Series T.V./F.M. radio models) and L5 is tuned by C22.

L5 and L7 are coupled by a slot in the screen between them, and L7 is tuned by C27.

In the next stage of the tuner, frequency changing is achieved by Tr2 which operates as a self-oscillating mixer with its base earthed to R.F. by C35. Base bias is obtained from the junction of R16 and R17. Signal injection from L7

is by L11 in the emitter circuit of Tr2. Between L11 and chassis is the emitter resistor of Tr2 (R13) and this is by-passed by C34. The oscillator tuned line is L13 which is tuned by C46.

Feedback from the collector of Tr2 to the emitter is provided by C42.

The collector output of Tr2 is tapped down L13 by C44, and the I.F. signals pass via the filter circuit L15/C55 to the I.F. output coil of the tuner, L16. The other end of L16 is taken out of the tuner via C57, and fed from the positive line via R22. C58 feeds the output from L16 to the coaxial cable which couples the U.H.F. tuner to the V.H.F. tuner.

Circuit Description—Vision I.F. and A.G.C. (All-valve I.F. Sections): Input signals from the V.H.F. tuner are taken from contact 2 of the system switch.

On 405-line operation, the signals pass via contact 3 of the system switch and C61, through the following circuits:

L20, C66, C71, R27: Bridge "T" sound rejector.

L23, C77, C76: 405-line adjacent sound rejector.

L24, C78: 405-line adjacent vision rejector (if fitted).

The signals then pass via R30 to contact 6 of the system switch.

On 625-line operation, the signals pass via contact 1 of the system switch and C64, through the following rejector circuits:

L21, C65: 625-line sound rejector.

L22, C67: 625-line adjacent vision rejector.

The signals then pass via R35 to contact 9 of the system switch.

From contact 7/8 of the system switch, the 405- or 625-line signals pass via a further rejector circuit to the control grid of V3:

L25, C82, C83, L26: 625-line adjacent sound rejector.

V3 is the first stage of a two-stage wideband amplifier; control grid bias is obtained from the A.G.C. line via R44, and screen grid bias from the H.T. line via R50. C92 is a screen grid by-pass capacitor; R45 and R46 are cathode resistors, and C90 is a cathode by-pass capacitor.

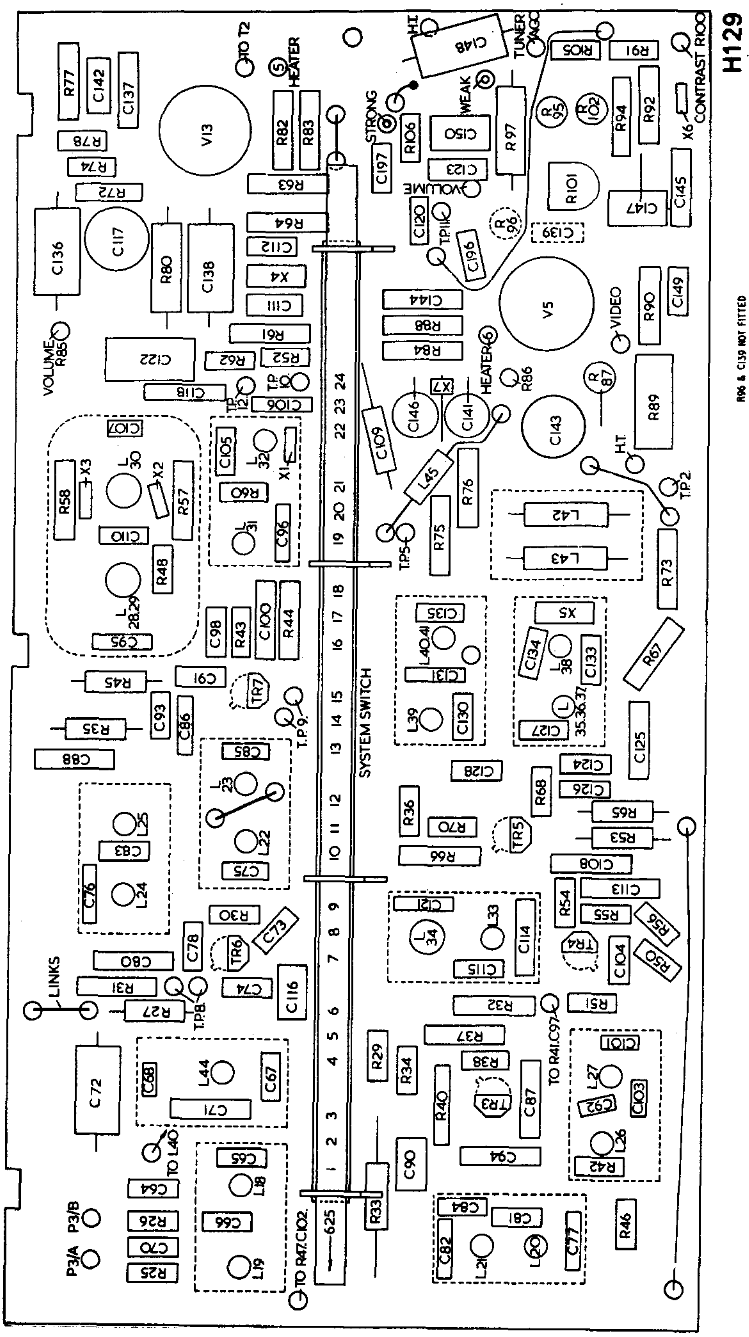
The anode load of V3 consists of R52 and L28; output signals from this valve are coupled to the grid of V4 by L28/L29 and C93. Control grid bias for V4 is obtained via L30 which prevents the I.F. signal from passing to earth. R56 is a cathode resistor and C96 a cathode by-pass capacitor. Screen grid bias is obtained from the H.T. line via R60, and C98 is a by-pass capacitor.

The anode load of V4 consists of L33 and R61. L33 is part of the transformer formed by L31, L33, L34 and L35, and the signals for the next stage are developed across L35.

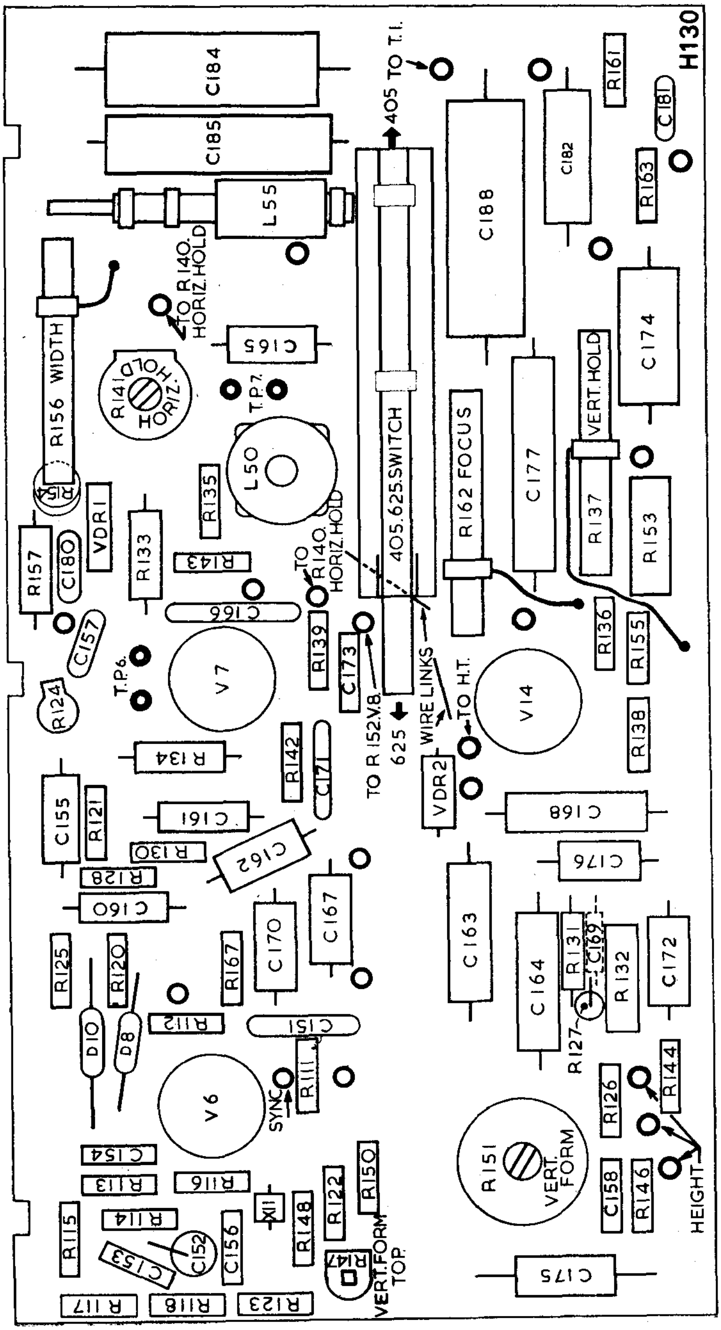
On 405-line operation, a further sound rejector (L32, C101) is switched into circuit; this reduces the bandwidth to 2·6MHz at −6dB, and cuts off higher frequencies.

On 625-line operation, C103 is switched into circuit to alter the tuning of L31, L33, L34 and L35.

X2 is the vision detector, and the detected signals are coupled to the grid of V5b as follows:



(H129) Component Locations—Transistorised I.F. Panel (PVS/3)



(H130) Component Locations—Timebase Panel (PT/6)

405-line: D.C. coupled via L36, L38, contacts 25 and 26 of the system switch, and R83.

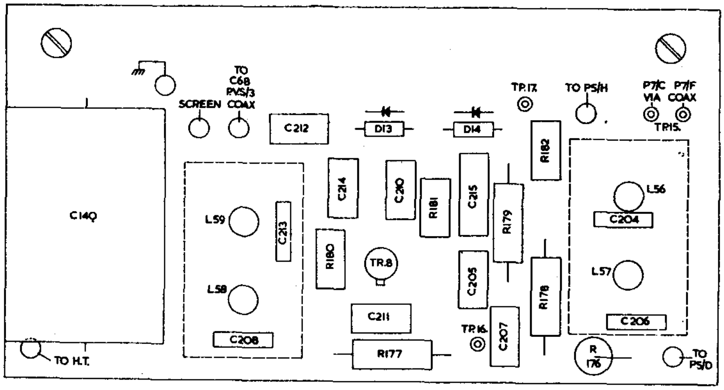
625-line: A.C. coupled via C118, contacts 25 and 26 of the system switch, and R83.

Screen grid bias is applied to V5a by R82, R76 and R77, and control grid bias is applied as follows:

On 405-line operation: via R78, the 625-line signals pass to earth via contacts 23 and 24 of the system switch.

On 625-line operation: via R81 and R77, to produce the same bias conditions as on 405-line operation. 405-line signals pass to earth via contacts 22 and 23 of the system switch.

V5a is the vision amplifier, and its negative-going video output (up to 100 V) is fed to the cathode of the C.R.T.



H131

(H131) Component Locations—Sound I.F. Amplifier (PA/11)

Circuit Description—Vision A.G.C. (All-valve I.F. Sections): The triode section of V5 is strapped as a diode. It is fed with signals from the anode of V5a via C128, and produces the A.G.C. voltage. Its rectification point is set by the contrast control which is in its cathode circuit and which provides a positive bias. The A.G.C. supply to V3 and the V.H.F. tuner is taken from the grid of V5b; the supply to the tuner is smoothed by C130, R96, C100, R40 and C73, that to V3 is smoothed by C130, R96, C100, R47 and C84.

In areas of low signal strength the ratio of the amount of A.G.C. applied to the V.H.F. tuner and to V3 can be altered by means of the weak/strong tapping. With the tapping in the "weak" position, R42 is connected between the A.G.C. line and chassis, on the "tuner" side of R40, and more A.G.C. is applied to V4 than to the tuner.

Anti-blocking circuits in the screen grid circuit of V5a, formed by R72, R76, C114 and X5, ensure that the A.G.C. will always restore after a strong interference signal. On 625-line operation, C111 is connected in parallel with X5.

This alters the time constant of the gating circuit containing X5, with respect to the time constant of the A.G.C. line, to prevent I.F. instability.

Circuit Description—Sound I.F. and A.G.C. (All-valve I.F. Sections): *On 405-line operation*, signals are fed from the V.H.F. tuner into the sound I.F. section via C62.

On 625-line operation, the inter-carrier sound system is employed and signals are fed from C116 in the vision detector via a length of coaxial cable to the sound I.F. section.

V11 and V12 form a dual-frequency I.F. amplifier working on 38·15 MHz and 6 MHz. L68, L78/L79, and L70/L72 are tuned to 38·15 MHz, and L69, L71/L73 and L76/L77 are tuned to 6 MHz.

The output of V11 is coupled to the grid of V12 by the transformers L70/L72 and L71/L73.

The output of V12 is coupled by transformers L76/L77 and L78/L79 to the sound detectors X1 (405-line sound), and X3 and X4 (625-line sound).

From the detectors, the signal is fed via C122 and the volume control R85 to the audio amplifier V13. The output from the anode of V13a is fed to the grid of V13b via C131 and R101. The anode of V13b is connected to the primary winding of the audio output transformer, which forms its load. The secondary winding feeds the loudspeaker. One end of the secondary winding is connected to chassis, and the other to the "earthy" end of the volume control R85. This provides negative feedback over the audio stages and improves the quality of the sound.

C126 is connected between the two anodes of V13 to provide negative feedback at high frequencies.

The primary winding of the transformer is fed directly from the 180 V H.T. supply, but a lower potential is applied to the screen grid of V13b via R99.

Circuit Description—Sound A.G.C. (All-valve I.F. Sections): *On 405-line operation*, the A.G.C. voltage is taken from the 405-line sound detector and fed to the grid of V11 via L69 and L68.

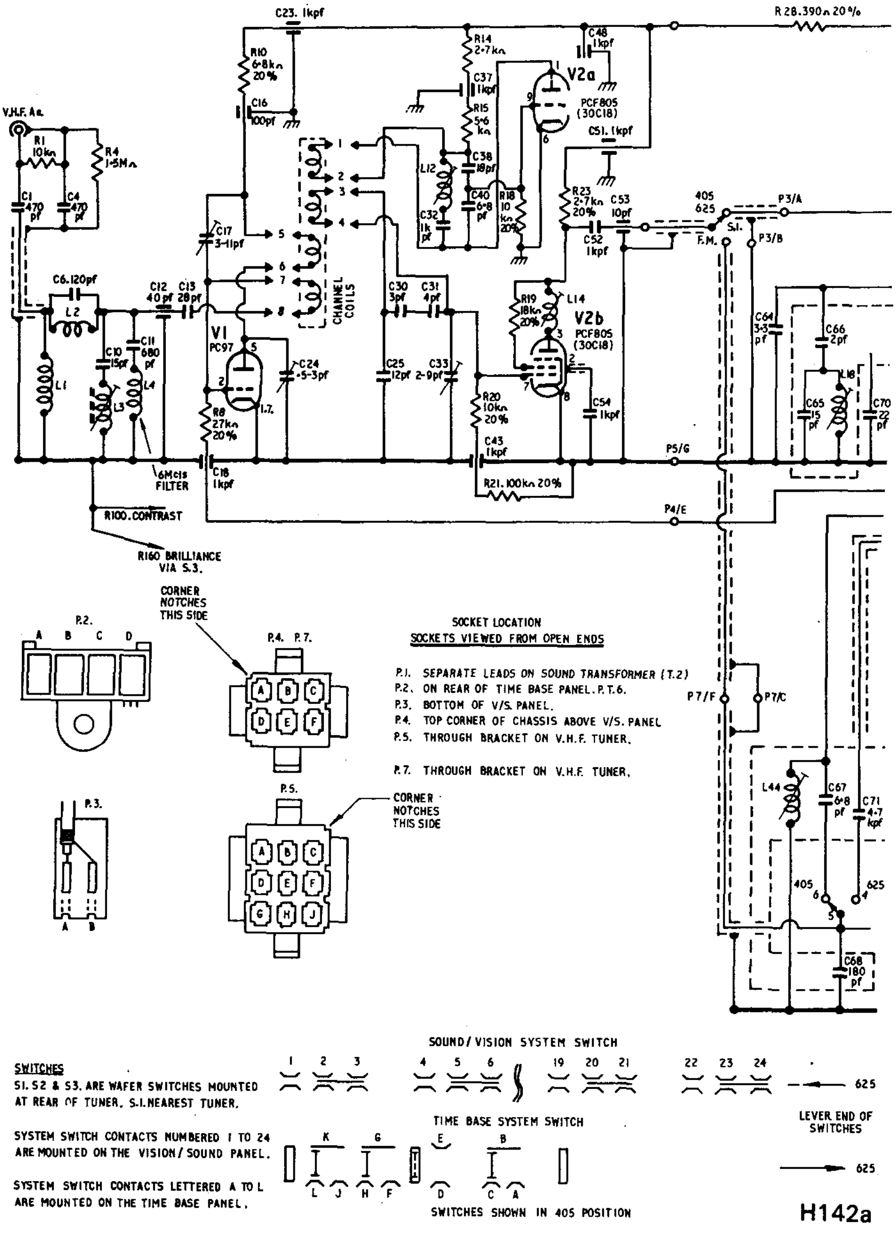
On 625-line operation, no A.G.C. control voltage is developed and V12 limits amplitude variations on the frequency modulated intercarrier signal.

Circuit Description—Vision I.F. and A.G.C. (Transistorised I.F. Sections): I.F. signals from the tuner are coupled by R25, L19 and C90 to the base of Tr3.

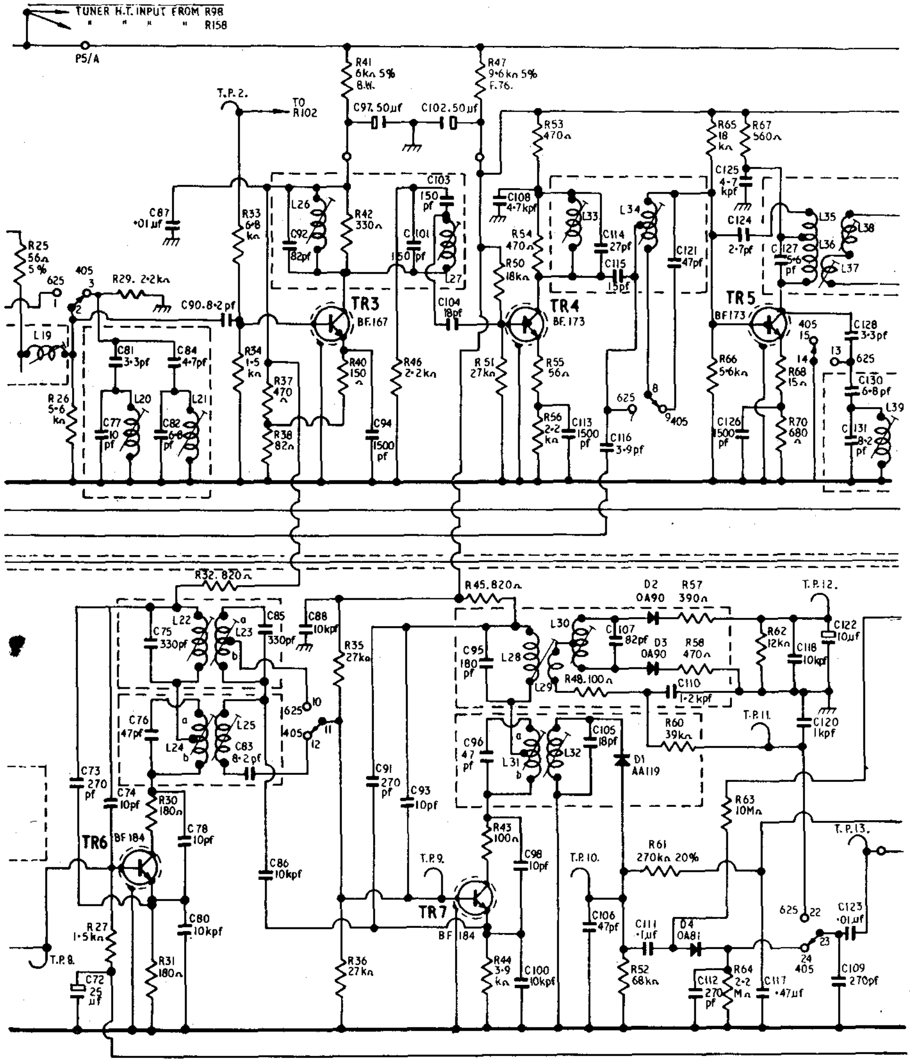
On 405-line operation, R29, C81, L20, C77, C84, L21 and C82 are switched into circuit. L20/C77 and L21/C82 are tuned to 33·15 MHz and 39·65 MHz respectively; L20 is thus the adjacent channel sound rejector and L21 the adjacent channel vision rejector.

On 625-line operation, L18, C65, C64 and C66 are switched into circuit. L18/C65 is tuned to reject the 625-line sound I.F. (33·5 MHz), so that the level of the sound carrier is below that of the vision carrier as the signal enters the vision I.F. amplifier.

Base bias for Tr3 is obtained from the junction of R33 and R34, and the remote end of R33 is fed with an A.G.C. voltage from the anode of V5b. The



(H142a) CIRCUIT DIAGRAM—670 SERIES T.V./F.M. RADIO (PART)



SOCKET CONNECTIONS

P. 2.
A — LIVE HORIZONTAL COILS
B — DEAD HORIZONTAL COILS TO SWITCH (G)
C — VERTICAL COIL TO CHASSIS
D — LIVE VERTICAL COIL

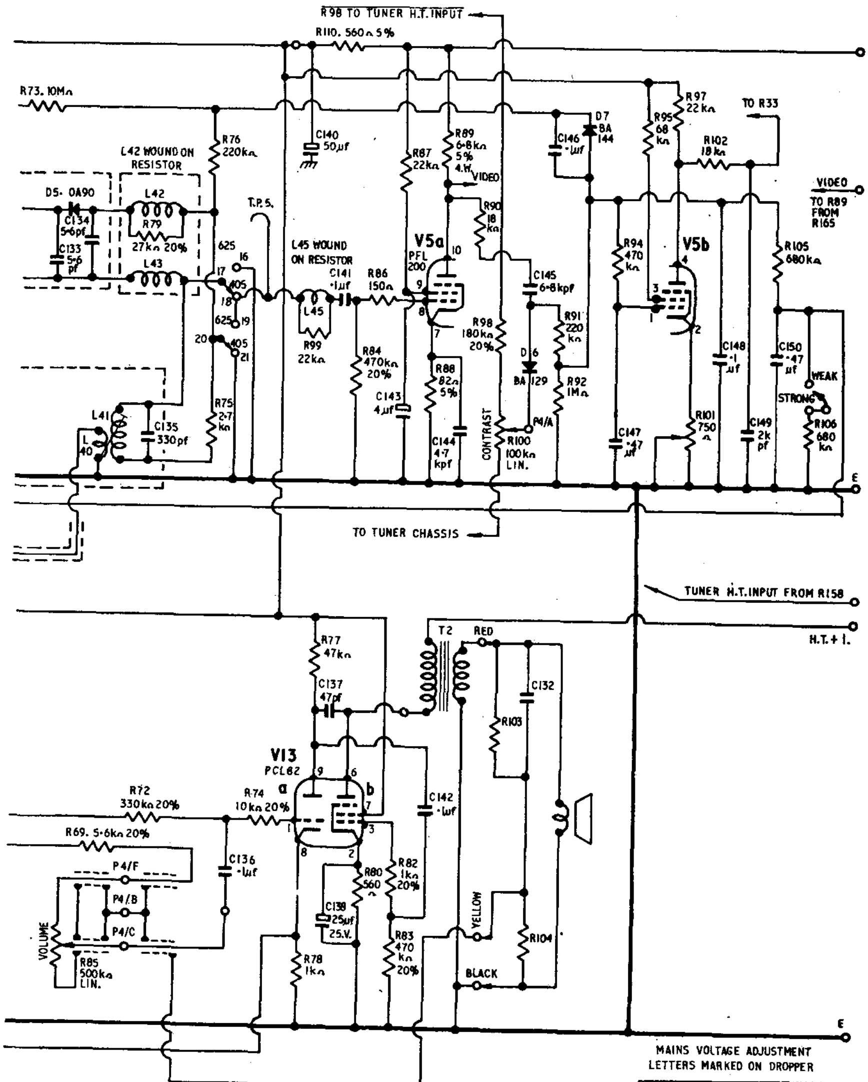
P. 3.
A — V.H.F. TUNER I.F. OUT. COAX
B — V.H.F. TUNER I.F. OUT. SCREEN

P. 4.
A — D.6. TO CONTRAST CONTROL (R100)
B — R103. R104 TO VOLUME CONTROL (R85)
C — C136 TO VOLUME CONTROL (R85)
D — R164 TO BRILLIANCE CONTROL (R160)
E — R.F. A.G.C. FROM V.H.F. TUNER
F — R69 TO VOLUME CONTROL (R85)

P. 5.
A — H.T. TO TUNER UNIT
B — S.3. TO C.R.T. HEATER CHAIN
C — 2 AMP. FUSE TO MAINS DROPPER (PURPLE)
D — BLANK
E — S.3. TO C.R.T. V.7. HEATER CHAIN
F — V.H.F. TUNER / P.V. & S.3 / HEATER CHAIN
G — V.H.F. TUNER CHASSIS TO MAIN CHASSIS
H — BLANK
J — ON. OFF. SWITCH TO CHASSIS

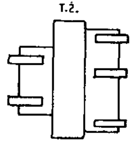
H142b

(H142b) Circuit Diagram—670 Series T.V./F.M. Radio (Part)



P.7.
A — S.2. TO R169 (RED)
B — S.2. TO H.T. (ORANGE)
C — SOUND TAKE OFF. SCREEN
D — S.2. TO R169. C186.
E — S.2. TO H.T. (RED)
F — SOUND TAKE OFF COAX.

T.2.

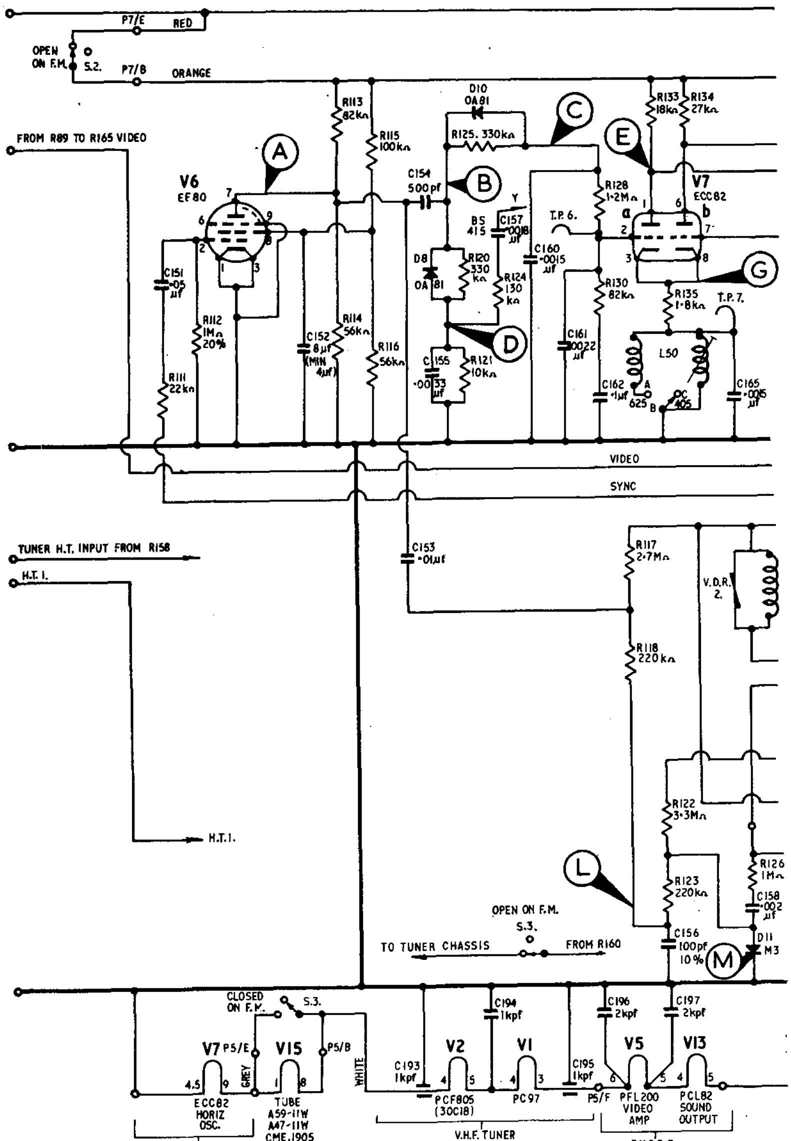


MAINS VOLTAGE ADJUSTMENT
LETTERS MARKED ON DROPPER

A.C. MAINS ONLY			
VOLTS	LEADS		
	PURPLE	BROWN	RED
200	C	B	D
210	C	B	D
220	C	B	D
230	C	A	E
240	C	A	E
250	C	A	E

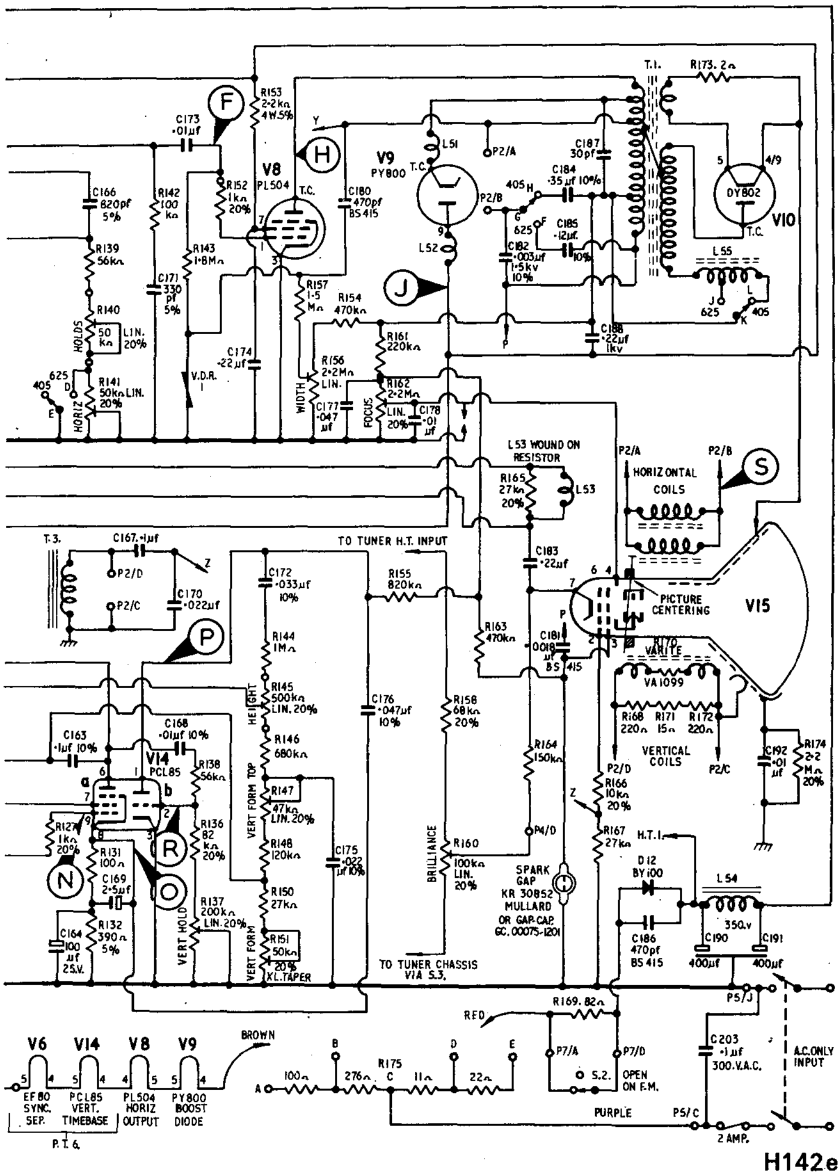
H142c

(H142c) Circuit Diagram—670 Series T.V./F.M. Radio (Part)



H142 d

(H142d) Circuit Diagram—670 Series T.V./F.M. Radio (Part)



(H142e) Circuit Diagram—670 Series T.V./F.M. Radio (Continued)

collector load of Tr3 is L26, which is tuned by C92 and damped by R42, R41 and R38 form a potential divider which reduces the potentials supplied to Tr3, and to Tr6 in the sound I.F. section.

The signals from L26 pass via L27 and C104 to the base of Tr4. L17 is tuned to 41·5 MHz by C101 and C103 and is thus the adjacent channel sound rejector.

Note: In certain areas, channel 1 is used for 405-line transmissions and the sound frequency for that channel is 41·5 MHz. Therefore L27 also prevents such signals from breaking through directly into the vision I.F. amplifier.

The emitter circuit of Tr4 contains R55 and R56 in series; R56 is by-passed by C113, and R55 is left unby-passed to give negative feedback. L33 is the collector load, tuned by C114, and is coupled to the base of Tr5 via C115 and L34.

On 405-line operation, L34 is tuned by C121 to 38·15 MHz, and forms the main 405-line sound rejector.

On 625-line operation, L34 is inoperative.

L36 is the collector load of Tr5 and is tuned by C127; the stage is neutralised by feedback to the base via C124.

On 405-line operation, L39 and its associated components are switched into circuit to provide rejection of the sound I.F. at 38·15 MHz.

On 625-line operation, C128 is switched into circuit to alter the tuning of L36 to give the required response.

Signals for the next stage are developed across L37 and L38 which are tuned by C133, and vision detection is provided by X5.

On 405-line operation, L42 is connected to chassis through contacts 20 and 21 of the system switch, and the positive-going output from L43 is fed to the grid of V5a via L45, R79 and R86.

On 625-line operation, L43 is connected to chassis through contacts 16 and 17 of the system switch, and the positive-going output from L42 is fed to the grid of V5a via L45, R79 and R86.

V5a is the vision amplifier, and its negative-going video output is fed to the cathode of the C.R.T.

Circuit Description—Vision A.G.C. (Transistorised I.F. Sections): The amplitude of the output signal from V5 is dependent upon input signal strength. The output is rectified by X6 and the resulting A.G.C. voltage is fed back via R91 to the V.H.F. tuner from the junction of R105 and C150. In areas of low signal strength the weak/strong tapping can be put in the "weak" position to apply the potential divider R105/R106, and so reduce A.G.C. action.

Because transistors are used in the I.F. section, it is necessary to convert the high-impedance A.G.C. voltage feed from V5a into a low-impedance current feed, suitable for controlling the gain of Tr3 by forward bias action. The rectified signal from V5a is therefore applied to the grid of V5b, and the D.C. output of this valve is extracted at the anode end of R97. This A.G.C. current is fed via R102 and R33 to the base of Tr3. The "no-signal" current through V5b is set by R101.

X7 is an anti-blocking diode which ensures that the A.G.C. will always restore when switching between weak and strong stations.

Circuit Description—Sound I.F. and A.G.C. (Transistorised I.F. Sections):

On 405-line operation, sound signals are taken from L34 to L44 via C116. C67 and C68 form a capacitive divider across L44, which is tuned to the 405-line sound I.F. of 38·15 MHz.

On 625-line operation, the 6 MHz signal in L41 is induced in L40 and taken by coaxial cable and C71 to the input of the sound I.F. section.

Either the 405- or the 625-line sound signals are connected via contacts 4, 5 and 6 of the system switch to the base of Tr6.

L24 and L25 form the 405-line sound transformer and L24 is tuned to 38·15 MHz by C76. L22 and L23 form the 625-line sound transformer and are tuned to 6 MHz by C75 and C85 respectively. The "earthy" ends of L23 and L25 are decoupled to the emitter of Tr7 by C86.

Signals from either of the transformers are switched by contacts 10, 11 and 12 of the system switch to the base of Tr7.

L31 and L32 form the final 405-line sound I.F. transformer and are tuned by C96 and C105 respectively. The final 625-line sound I.F. transformer is formed by L28 and L30, which are tuned by C95 and C107 respectively.

From L32, the output is fed to the 405-line sound detector X1 whose load is R52. C106 is connected in series with R52 to by-pass any R.F. The detected sound is fed via C111 and X4 to contact 24 of the system switch. X4 is a conventional series noise limiter for reducing the effects of impulsive interference, and is supplied with "conducting" bias by R63 from the H.T. line and R64 from chassis. The value of C112 is chosen to provide the time-constant resulting in optimum suppression of interference.

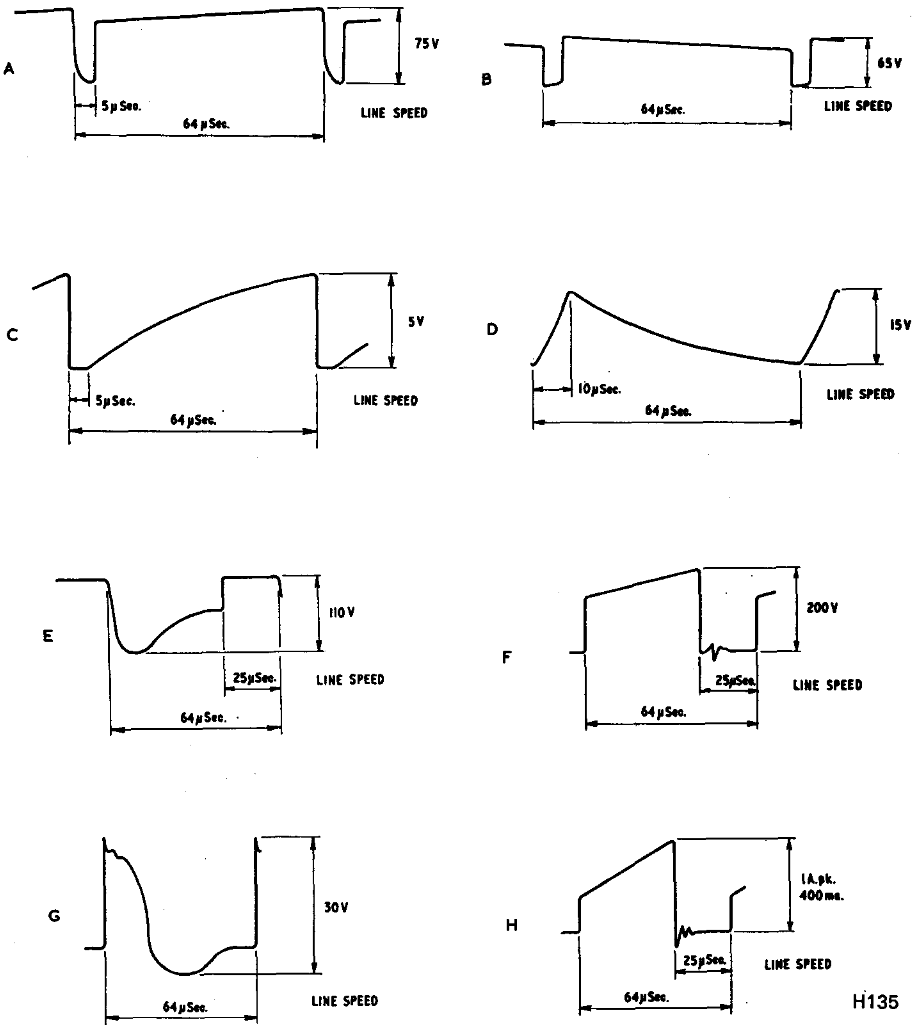
6 MHz 625-line sound signals are fed from L30 to a ratio detector circuit consisting of X2, X3, R57, R58, R62, C118 and C122.

The A.F. output from L29 is fed via R48 and R60 to contact 22 of the system switch.

Either 405- or 625-line sound signals are fed from contact 23 of the system switch to the volume control R85, via C123 and R69. (On 625-line operation C109 and R60 form a de-emphasis network, and C109 also by-passes R.F.). Signals are tapped from R85 at the required amplitude and fed via C136 and R74 to the grid of V13a. The amplified A.F. signals appearing across the anode load (R77) are passed via C142 and R82 to the control grid of V13b. R83 is the grid resistor of V13b, and cathode bias is developed across R80 which is by-passed by C138. The anode load is the primary winding of the audio output transformer T2, the secondary winding of which feeds the loudspeaker.

One side of the secondary winding is connected to the "earthy" end of the volume control R85, to give negative feedback over the audio stages and improve the quality of the sound. C137 is connected between the two anodes of V13 to give negative feedback at high frequencies.

The primary winding of the audio output transformer is fed directly from the 280 V H.T. line, but R77 and the screen grid of V13b are supplied from the



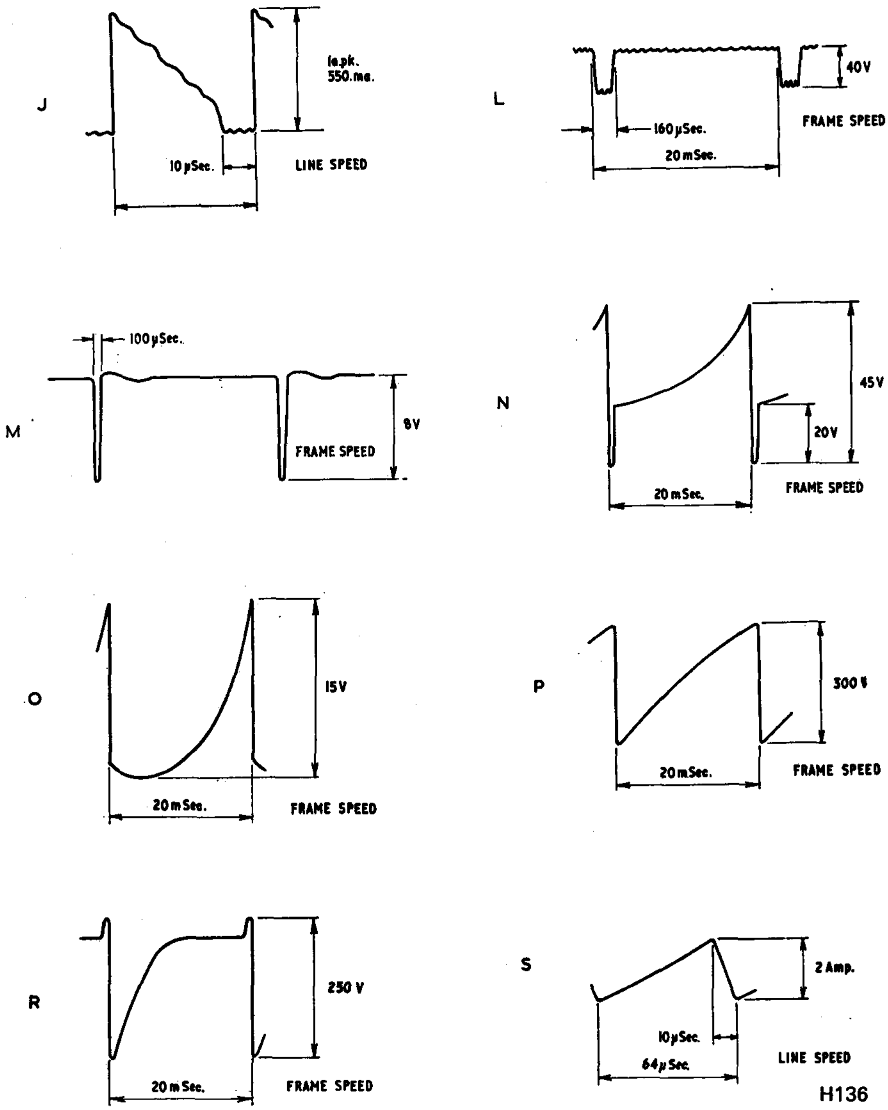
(H135) TIMEBASE SECTION WAVEFORMS—660, 670 AND 680 SERIES. THE LETTERS REFER TO TEST POSITIONS ON CIRCUIT DIAGRAMS

vision I.F. stage H.T. line; this supply is below the main H.T. voltage because it is obtained via the dropper resistor R110.

Circuit Description—Sound A.G.C. (Transistorised I.F. Sections):

On 405-line operation, the detected output developed across R52 is fed via a smoothing network R61, C117 and R72, and via R74, to the grid of V13a.

As the output of X1 is negative and its amplitude depends upon the level of the input signal, the anode current of V13a varies in inverse proportion to the



(H136) TIMEBASE SECTION WAVEFORMS—660, 670 AND 680 SERIES. THE LETTERS REFER TO TEST POSITIONS ON CIRCUIT DIAGRAMS

signal strength. There is a resistor (R78) in the cathode circuit of V13a, and the cathode potential therefore depends upon the negative bias applied to the grid of the valve, and decreases as the bias increases. The cathode potential is applied via R27 to the base of Tr6, so that A.G.C. action is achieved, an increase of signal strength causing a reduction of the gain of Tr6.

On 625-line operation, no A.G.C. control voltage is developed and Tr6 limits amplitude variations on the frequency modulated inter-carrier signal.

Circuit Description—F.M. Radio Operation (670 Series T.V./F.M. Radio Models): On F.M. radio operation, the sound signals are taken from the output of the V.H.F. tuner via the system switch, and fed via coaxial cable to the base of Tr6.

Circuit Description—F.M. Radio Operation (680 Series T.V./F.M. Radio Models): An additional sound I.F. stage (PA11), is included to increase the gain of the sound section.

On F.M. radio operation, sound signals are taken from the output of the V.H.F. tuner via the system switch and a coaxial cable to the input of the additional stage. The cable screen is connected to chassis, and the central conductor feeds the signal into the primary winding (L56) of an I.F. transformer. L56 and the secondary, L57, are tuned to 6MHz by C204 and C206 respectively. The transformer output is tapped from L57 and fed to the base of Tr8 via C205.

The supply to the collector of Tr8 is taken from the V.H.F. tuner supply via the system switch, when the switch is in the "F.M." position.

The output from D14 is negative, and is proportional to the level of the input signal. This varying negative potential is applied via the system switch and R8 to the grid of V1 in the V.H.F. tuner. The gain of V1 therefore varies in inverse proportion to signal strength, and A.G.C. action is achieved.

A.G.C. in the remaining I.F. stages is the same as for T.V. operation.

Circuit Description—Timebases: The diodes in the timebase sections are identified by "X" numbers on some circuit diagrams and by "D" numbers on others. Both "X" and "D" numbers are used in this description, the "D" numbers being given in brackets.

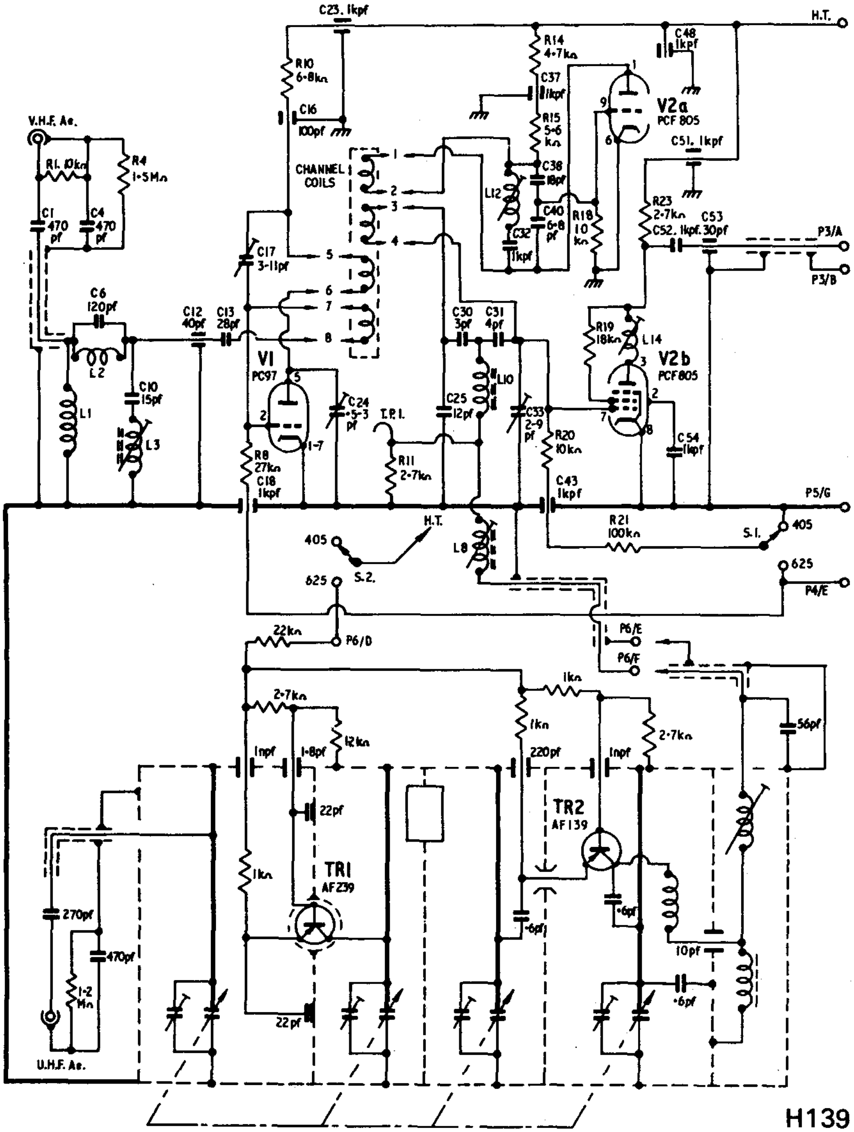
The video output from the vision I.F. amplifier is taken from the cathode of the C.R.T. via R111 and C151 to the grid of the synchronization separator V6.

Circuit Description—Line Timebase: X8 and X10 (D8 and D10) are phase discriminator diodes: they are fed with synchronization pulses from the anode of V6 and with integrated pulses fed back from the line output transformer T1. A phase difference between these two signals causes a control voltage to be developed across C160, which is fed into the control grid of V7a.

V7 is a cathode-coupled multivibrator, tuned by L50 in the cathode circuit. L50 is tuned to line frequency, but the operating frequency of V7 can be adjusted by means of the hold controls R140 and R141.

Line drive output from the anode of V7b is fed via C173 to the control grid of V8, the line output valve, and the waveform is shaped by R142 and C171. The operation of V8 is stabilised by the voltage-dependent resistor VDR1 to allow for variations of line voltage. V9 is a boost diode working in conjunction with V8; during each flyback period it recovers energy from T1 and C188 becomes charged. This provides a source of boosted H.T. at 800V.

The line output transformer T1 is harmonically tuned by L55, which has tappings for 405- and 625-line operation. It provides the supply to the line-scanning coils of the C.R.T., and the E.H.T. supply (rectified by V10 at



(H139) Circuit Diagram—Hopt U.H.F. Tuner

20kV) to the final anode of the C.R.T. Feedback is taken from the primary via C180 for the stabilisation circuit of V8, and via C157 and R124 for the phase discriminator circuit.

Circuit Description—Frame Timebase: Synchronization pulses from

the anode of V6 are fed via C153 to the integrating network formed by R118, R123 and C156. The resulting frame synchronization pulses are amplified by the pentode section of the frame timebase oscillator (V14a), and fed to the grid of V14b via C168 and R138.

Each pulse train in turn renders V14b fully conducting, causing C176 to discharge between cathode and anode. C176 is re-charged by current through R155 so that when the next pulse train arrives at the grid of V14b the process is repeated and a sawtooth waveform is produced. A blocking diode X11 (D11) prevents spurious pulses from triggering V14b while C176 is re-charging.

R146, R147, R148, C175 and C163, R150 and R151 form a feedback network which correctly shapes the waveform, and the height control R145 sets the voltage amplitude. The signal pick-off from R145 is fed to the grid of V14a whose anode load is the primary winding of the frame output transformer T3. VDR2 protects the primary by reducing flyback voltage pulses.

From the secondary of T3, the frame scanning current is fed to the frame coils on the C.R.T. via the Varite resistor R170. This resistor is temperature-dependent, and is mounted on the deflector coil assembly to provide temperature compensation.

Circuit Description—Power Supply: From the mains connector, the supply is taken to the two-pole, two-throw switch on the volume control. Diode X12 (D12) rectifies the supply, which is smoothed by C190/C191 and L54. C186 is connected across the diode to protect it from high voltage transients.

B.R.C. Schools T.V. Model 027

General Description: Dual-standard receiver for operation on 50Hz A.C. mains supplies. Note that U.H.F. and V.H.F. tuners are described in the information given on the Thorn 900 Series (1965–66 volume) and 950 Mark II Series (1967–68 volume). The information that follows is to be used in conjunction with the Thorn 950 Mark II Series service information.

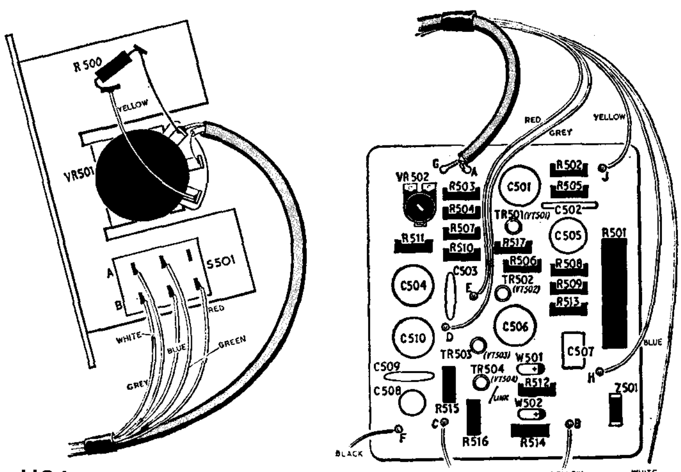
Mains Voltage Adjustment: The mains adjustment plug and socket is located on a panel mounted on top of the mains transformer.

Fuse: A 2-amp mains input fuse is fitted. If replacement becomes necessary, a fuse of the same type and rating should be used.

U.H.F. Tuner Push-buttons: Individual tuning adjustments may be made by depressing the appropriate button and inserting a screwdriver through the hole in the centre of the button to engage the adjusting slot inside. Whilst making the adjustment hold the button against the screwdriver pressure. Three of the buttons are locked but may be released for use by removing the paxolin spacer tube from the push-button spindle.

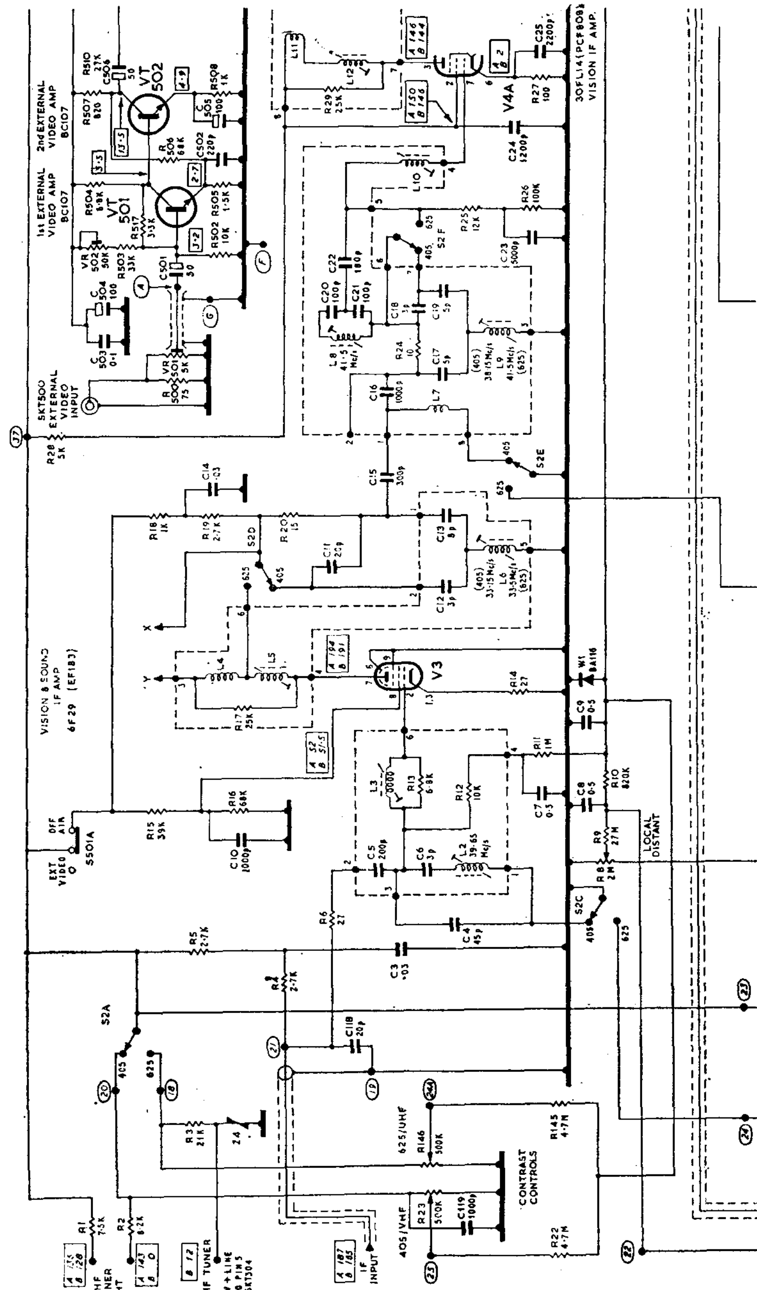
Access for Service: All parts of the chassis are readily accessible for servicing purposes simply by slackening the pivot locking nuts and lifting the chassis to allow it to be hinged upwards and locked in any position by the pivot nuts. For easier access to components at the front of the printed board, turn receiver upside down before pivoting the chassis.

Dismantling V.H.F. Tuner: Slacken grub screw in the side of channel selector knob to release it. Remove screw securing bonding strip to tuner chassis then remove two slotted nuts retaining tuner unit to cabinet. When refitting, note that bonding strip is located on right-hand fixing stud.



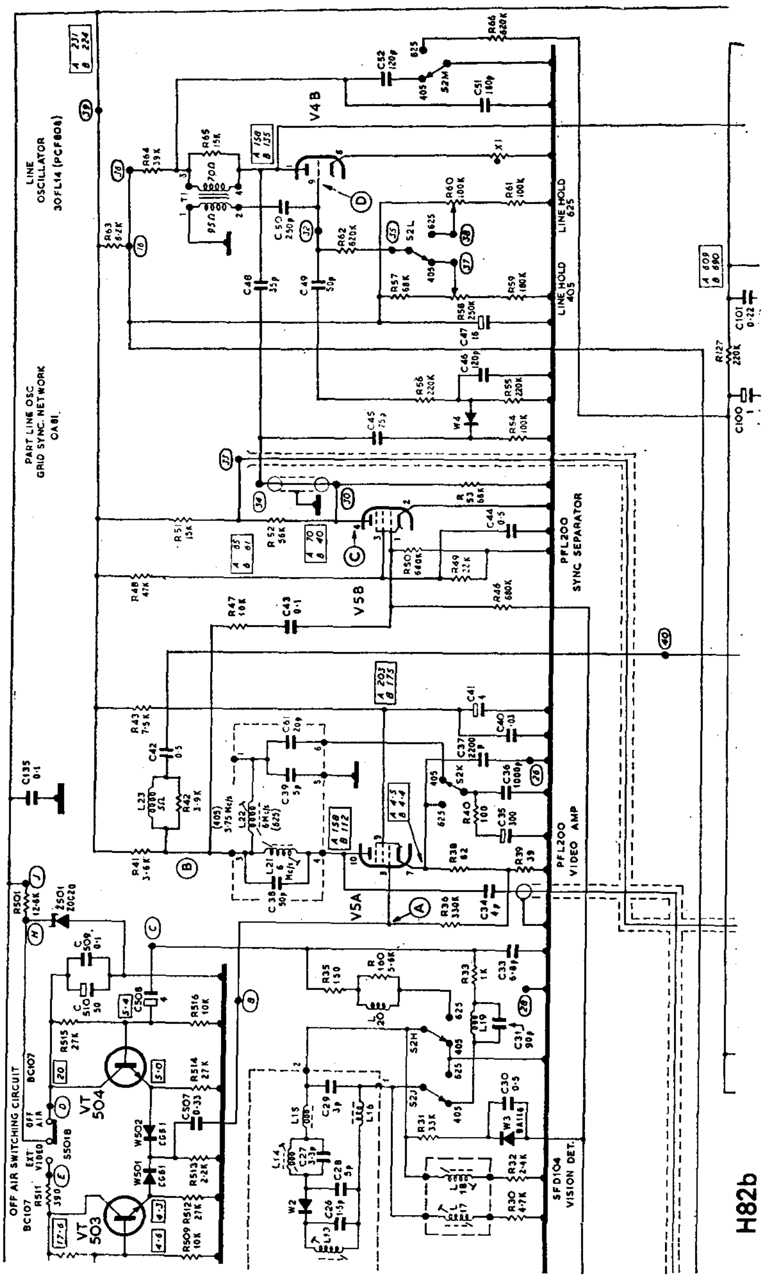
H84

(H84) VIDEO UNIT—MODEL 027



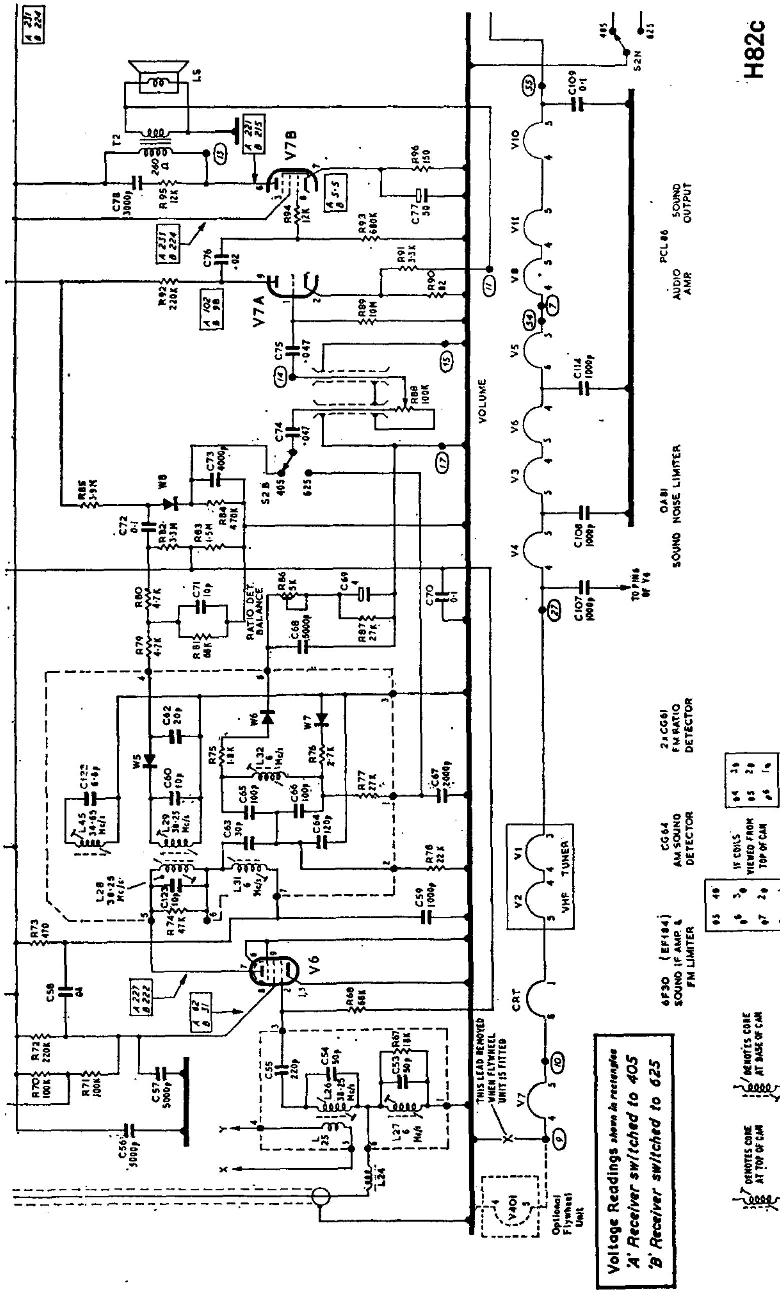
H82a

(H82a) Circuit Diagram—Model 027 (Part) (Circuit is Continued on H82b and H82c)

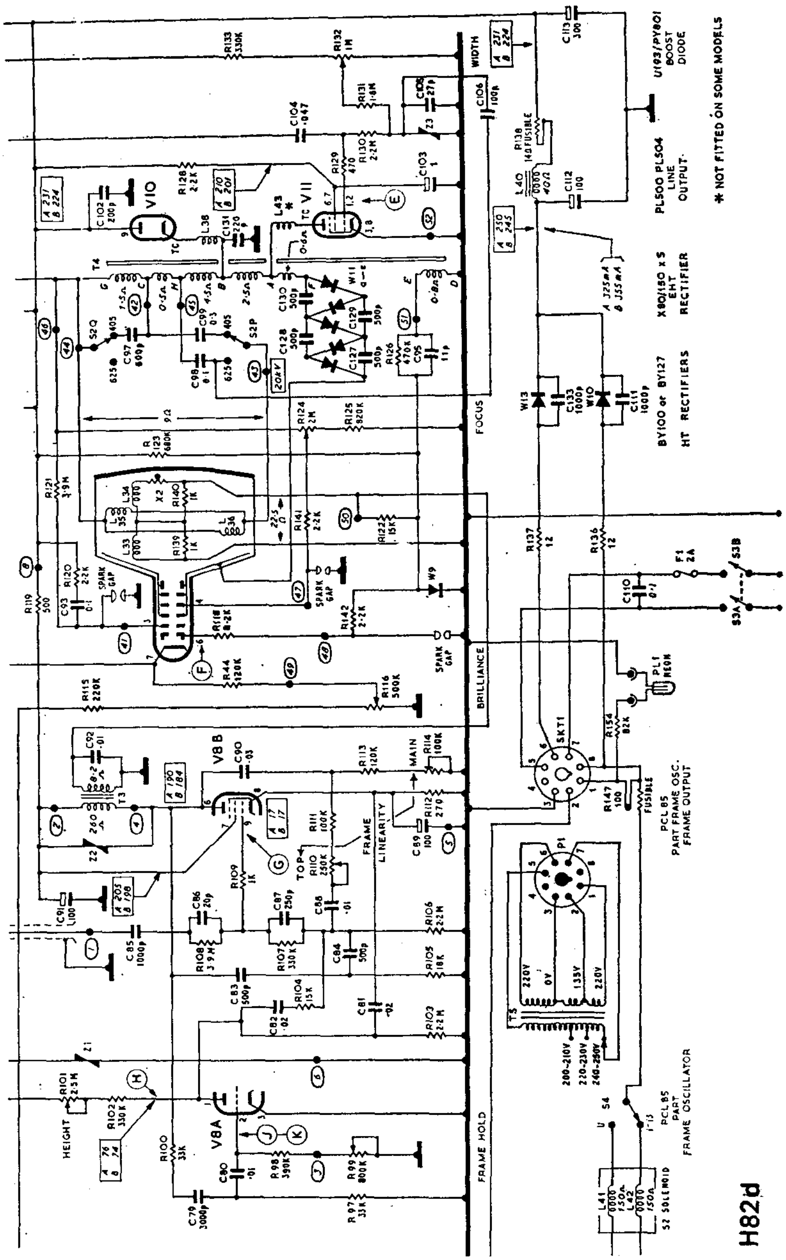


H82b

(H82b) Circuit Diagram—Model 027 (Part) (Circuit is Continued on H82a and H82d)



(H82c) Circuit Diagram—Model 027 (Part) (Circuit is Continued on H82a and H82d)



(H82d) Circuit Diagram—Model 027 (Part) (Circuit is Continued on H82b and H82c)

H82d

Dismantling U.H.F. Tuner: Detach plug from top of V.H.F. tuner and remove two slotted nuts to release tuner from cabinet.

Dismantling Controls Mounting Panel: Pull off the brilliance, volume and off/on control knobs and remove two slotted nuts from inside the cabinet to release the panel. The tuners and control mounting panel remain connected to the main chassis through interconnecting cableforms, but lead lengths are sufficient for normal service requirements.

Dismantling Main Chassis: To release chassis assemblies completely from cabinet, release main chassis bonding strip from mains transformer and unplug the following connections: mains transformer plug from left-hand side of main chassis, neon lamp connectors from tag-strip on left-hand chassis panel, loudspeaker connectors from sound output transformer, tube base connectors and E.H.T. anode connector. Remove screw securing C.R.T. earthing lead to chassis right-hand side panel. Slacken deflection assembly clamping screw and slide the assembly from the tube neck. Remove pivot nuts to release the mounting pivots from the slots and then withdraw the complete assembly including tuners and controls mounting panel, from the cabinet.

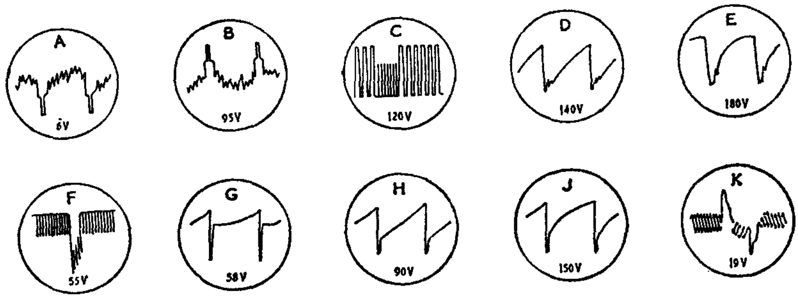
Note: Brass strips are used to provide bonding between the various chassis assemblies. Ensure that all bonding strips are correctly positioned when refitting the chassis.

C.R.T. Removal: Remove the chassis assemblies as described. Uncouple the tube earthing spring from one side then lay receiver face downward on a suitable protective surface. Remove nut and washer from each of the four C.R.T. fixing brackets then carefully lift the tube clear. When reassembling the C.R.T. into the cabinet, note that the E.H.T. anode connector must be on the right and do not omit to reconnect the C.R.T. earthing spring and the 2·2MΩ discharge resistor to the top right-hand tube fixing bracket.

Circuit Notes: U.H.F. and V.H.F. tuners are described in the 1967–68 volume, but, it should be noted that C361 is 0·7 μF. For pre-set tuning mechanical details of V.H.F. tuner see 1965–66 volume. All other V.H.F. tuner mechanical details are as type 1500, 950 Mark II Series information.

TRANSISTORS AND VALVES

VT351	AR139 or AF186	R.F. amplifier — U.H.F.
VT352	AF139	Self-oscillating mixer — tuner
V1	PC97	R.F. amplifier — V.H.F.
V2	PCF805	Oscillator and mixer — tuner
V3	6F29 (EF183)	Vision and sound I.F. amplifier
V4	30FL14 (PCF808)	Vision I.F. amplifier and line oscillator
V5	PFL200	Video amplifier and synchronization separator
V6	6F30 (EF184)	Sound I.F. amplifier and F.M. limiter
V7	PCL86	Audio amplifier and sound output
V8	PCL85	Frame oscillator and frame output
V10	U193 (PY801) PY81	Boost diode
V11	PL500	Line output
CRT	CME 2312/A59-25W/S	Mazda Rimguard II
VT501	BC107	First external video amplifier
VT502	BC107	Second external video amplifier
VT503	BC107	Off air/external video switching
VT504	BC107	circuit



H83

(H83) Oscillograms—Model 027

Circuit Voltages: Figures in rectangles are D.C. voltage measurements. They were taken on a mains input of 240 V A.C. using the 240–250 V tap, with no signal input, and contrast controls and local/distant (R8) at maximum; all other controls set for normal operation. E.H.T. was measured with an electrostatic meter; all other voltages with a model 8 Avometer.

Circuit Inductors: D.C. resistances are given in the circuit diagram if 1 Ω or greater.

Circuit Tag Connections: Ringed figures, or letters in the video unit circuit, indicate connecting points on the components side of the printed board.

Oscillograms: (A), (B), (D), (E) and (F), were taken at 405-line frequency, (C), (G), (H), (J) and (K) at frame frequency at the points indicated by corresponding letters in the circuit diagram. The voltage figures given with the oscillograms (diagram H83) represent peak-to-peak amplitudes measured via a probe of 8 pF capacitance in parallel with 10 MΩ.

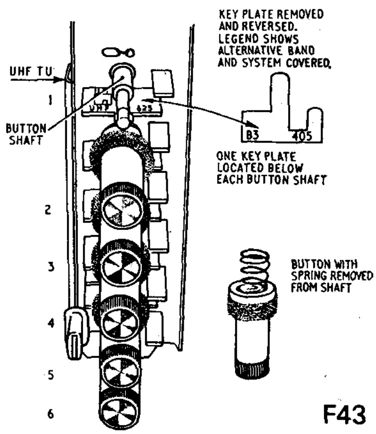
Note: (K) was taken with the frame oscillator rendered inoperative by earthing V8B grid.

BUSH

Models TV161U, TV165, TV166U and TV166C

General Description: The TV161U and associated models are superheterodyne television receivers consisting of a tuner unit and a main chassis with plug-in timebase and I.F. amplifier. Each receiver contains seven valves, fifteen diodes and thirteen silicon transistors; the combined V.H.F./U.H.F. tuner unit and I.F. amplifiers are transistorised. The push-button mechanism of the multiband tuner unit controls the system switches and combined V.H.F. and U.H.F. tuner units. Each of the six push-buttons may be pre-set tuned to any channel in Bands I, III, IV or V: the appropriate line system is automatically selected. Two separate half-wave silicon rectifiers provide valve heater and H.T. supplies.

Circuit Features: Delayed amplified A.G.C. to the R.F. stage (V.H.F.). Amplified A.G.C. to the first I.F. stage. The V.H.F. mixer stage acts as an I.F. amplifier on U.H.F. operation. Line and frame flyback suppression. Stabilised frame and line timebases. Line flywheel synchronization. Black level correction.



(F43) TUNER UNIT PUSH-BUTTONS—MODELS TV161U, TV165, TV166U AND TV166C

Sensitivity: 10 μV average over the band for 1 V D.C. output at the vision diode load.

Sound Output: 0·75 W.

Power Supply: 240 V (50 Hz), A.C. only (165 W).

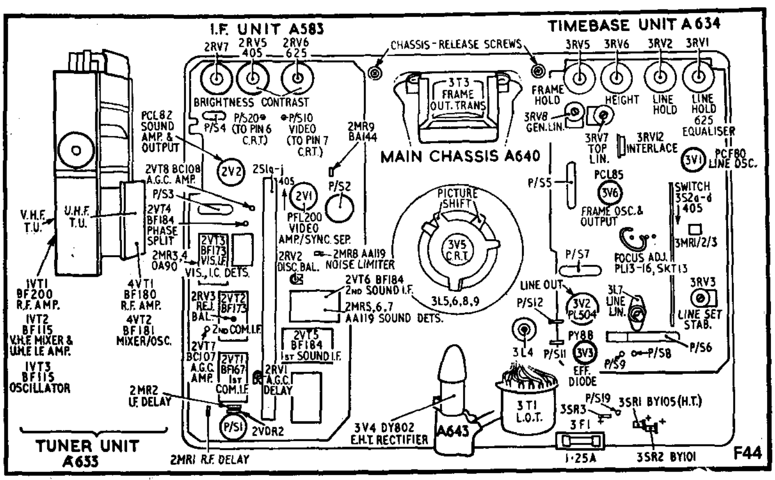
Sub-units: Tuner unit (A633), receiver unit (A583), timebase unit (A634), line transformer (A643 or A682), scan coils (A562 or A578) and main chassis (A640).

Adjustments (Band and System Selection): Any push-button of the tuner unit (A633) can be set to operate on a different band or transmission system in the following manner:

1. Remove the tuner unit from the cabinet.
2. With the tuner unit viewed as in diagram F43 the information stamped on the upper face of the key plate indicates the band covered and the transmission system for that button.
3. Withdraw the key plate from the spring-loaded slot under the push-button spindle which is to be reset.
4. Insert the new keyplate into the slot, correct side up. The button can be tuned over the band and will operate on the transmission system indicated on the upper face of the key plate.

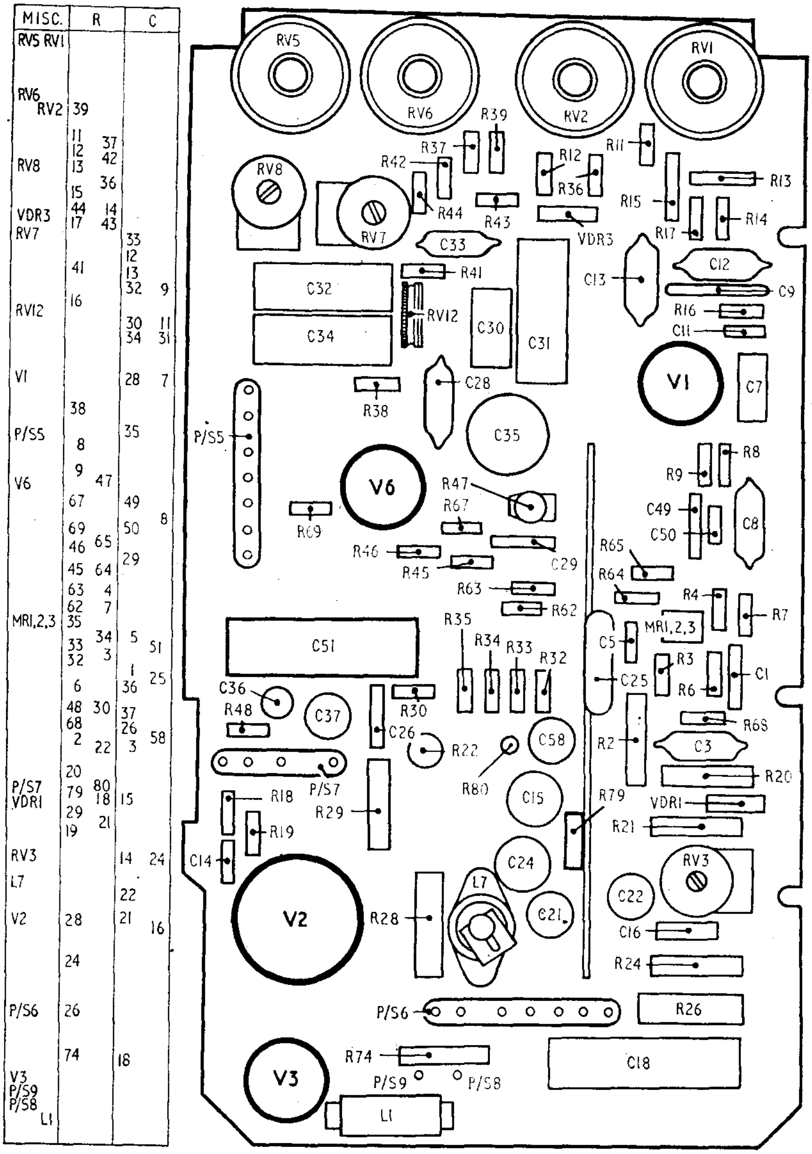
Adjustments (Interlace Control 3RV12): This control should be adjusted for minimum pairing on both 405- and 625-line systems. The control will produce an interlaced picture at more than one setting and the following procedure is recommended. Turn the control fully clockwise (as viewed from the side of the control with the moulded knob). Now rotate the control as far as possible in a anticlockwise direction (towards maximum resistance) consistent with correct interlace and freedom from the appearance of the B.B.C. "pulse and bar" at the top of the picture.

Adjustments (A.G.C. Delay 2RV1): Adjust the control on the strongest signal for freedom from overloading and minimum "noise" on the picture.



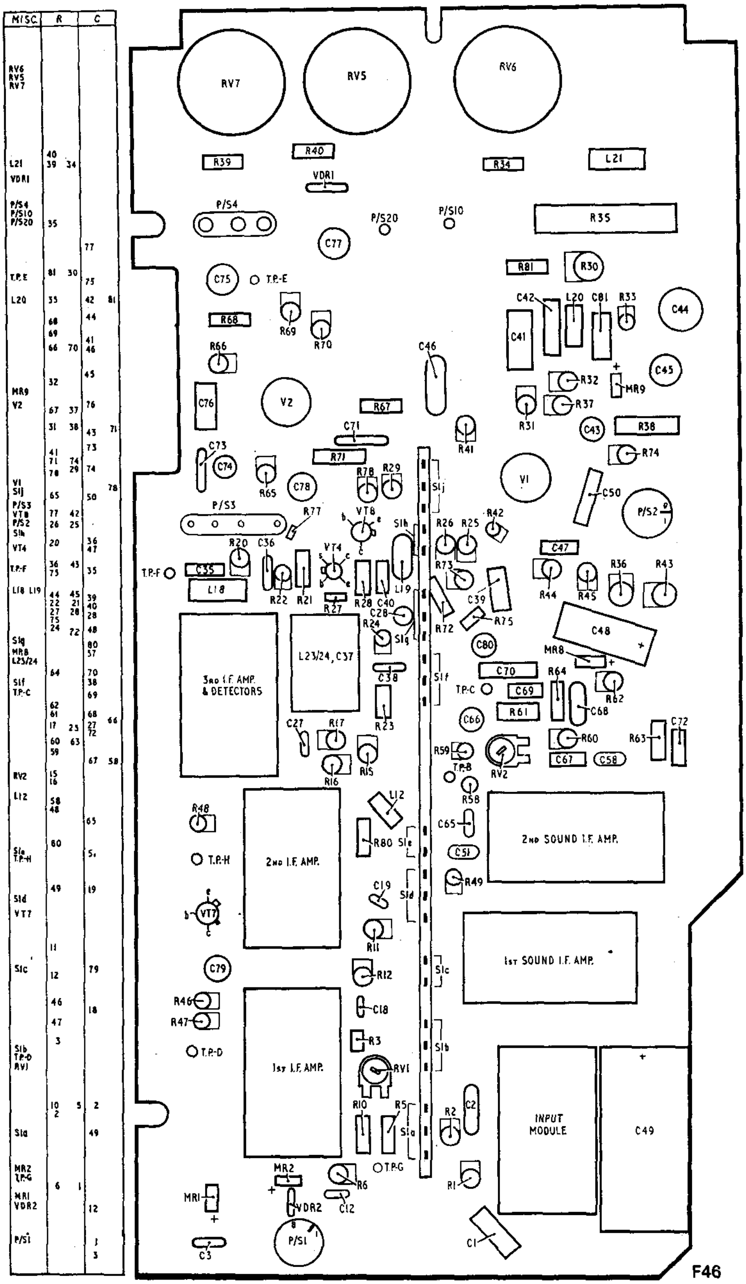
(F44) Rear Chassis View—Models TV161U, TV165, TV166U and TV166C

Dismantling (Main Chassis): Before releasing the chassis, unclip the system switch drive at the upper left edge of the chassis. The top of the chassis is held in position by two self-retaining screws and a support wire with clip. When lifting the chassis from its two nylon supports, be careful to clear the tube neck. Note that the chassis and tuner unit are connected by a braided lead. The outer coating of the tube is connected directly to chassis by a spring contact: the tube support brackets are connected by a soldered lead to 3R75 and 3C53 and then to chassis.



F45

(F45) Component Locations—Timebase Unit A634. Note All Component References Carry the Prefix 3 on Appropriate Circuit Diagram and Parts List



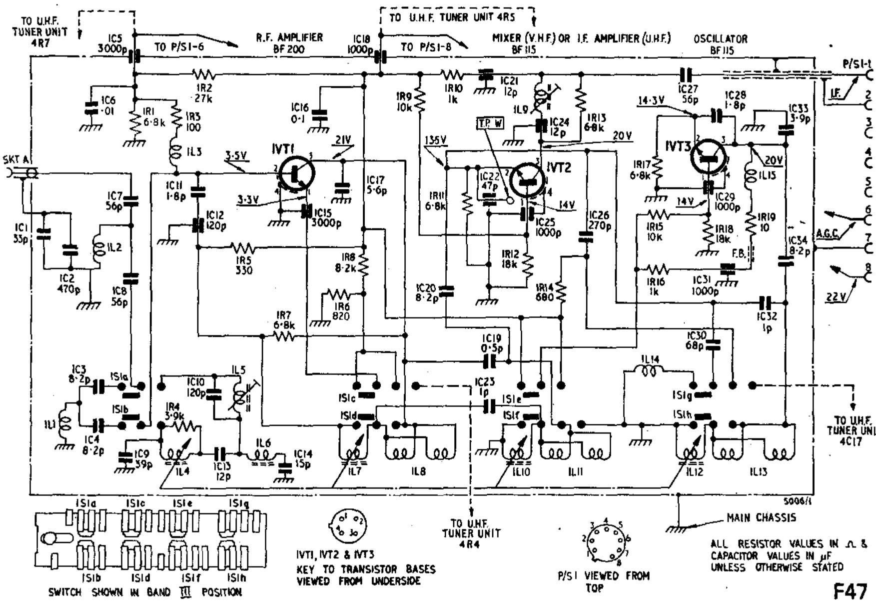
(F46) COMPONENT LOCATIONS—RECEIVER UNIT A583. COMPONENT REFERENCES ABOVE CARRY PREFIX 2 ON APPROPRIATE CIRCUIT DIAGRAM AND PARTS LIST

Dismantling (Printed Panels): One edge of each panel is held by two spring clips mounted on the edge of the chassis; the other edge slides under three tabs. When reassembling, make sure that the system switch lever engages with the system switch link and that the "throw" of the switch is correct. The "throw" is adjusted on the receiver unit panel by moving the panel vertically then tightening the screws at top and bottom of the panel. On the timebase panel, the throw is adjusted by opening or closing the V-shaped system switch link.

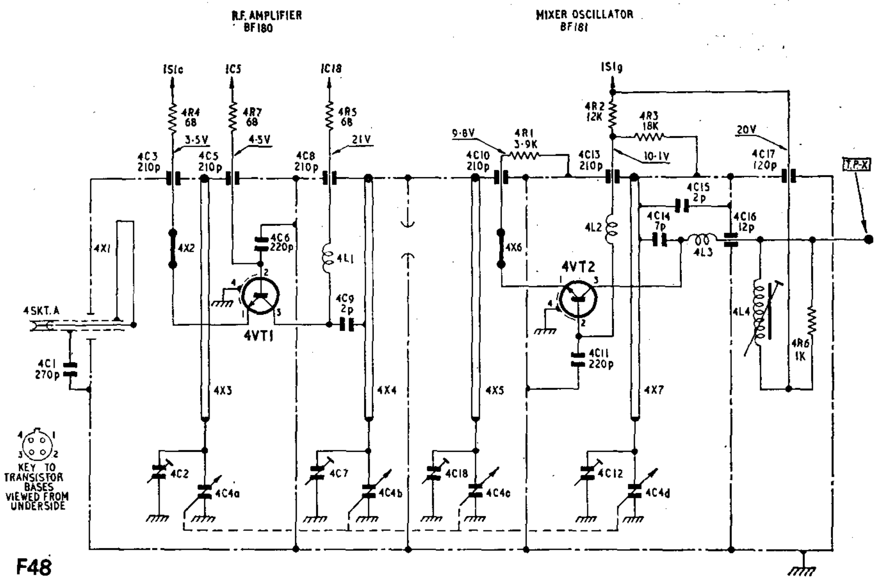
Circuit Information (Heater Supply): The mains supply is A.C. only as 3SR2 takes the place of the usual mains dropping resistor and supplies the heater chain with half-cycle pulses of unsmoothed direct current. Under these supply conditions, voltages measured with an Avo model 8 will indicate approximately three-fifths of the applied voltage. For example, the voltage measured across the C.R.T. heater will read 3·8 V D.C. although the correct voltage of 6·3 V is applied. The voltage across the total heater chain (valves only) is 75 V nominal measured at P/S8 with the Avo model 8 on the 100 V D.C. range.

If 3SR2 develops a short-circuit, the heaters will be overrun although the set appears to operate normally. To introduce a visible effect of this fault condition, the screen grid of 2V1b is fed from the heater line; the effect of the rectifier short circuit will appear as "frame slip".

Circuit Information (Vision A.G.C.): The negative voltage at the grid of the synchronization separator 2V1b is used for mean-level automatic gain control; the system operates at a level set by the positive voltage from the



(F47) Circuit Diagram—V.H.F. Tuner Unit A633



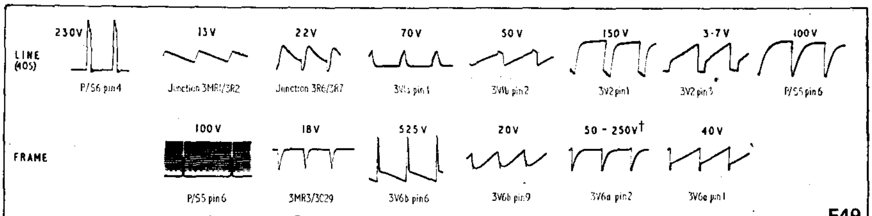
(F48) Circuit Diagram—U.H.F. Tuner Unit A633

contrast control 2RV5 or 2RV6. The emitter follower 2VT8 matches the high impedance source of the resultant control voltage to the base of the A.G.C. amplifier 2VT7. The amplified forward A.G.C. voltage (see diagram F50b) at the collector of 2VT7 is smoothed by the action of 2C79 and applied to 2MR1 and 2MR2 which act as switches.

Both these diodes have a fixed bias, the bias for 2MR1 anode is derived from 1R1 and 1R2, that for 2MR2 cathode from 2RV1, 2R5 and 2R10. The conduction of the diodes therefore depends on the value of the A.G.C. voltage relative to the fixed bias. When the input signal and therefore the A.G.C. voltage is small, 2MR1 does not conduct but 2MR2 does. The A.G.C. voltage is applied through 2MR2 to 2VT1 and reduces its gain; but the gain of 1VT1 remains at a maximum, the base being biased by 1R1 and 1R2. Larger signals increase the A.G.C. voltage until 2MR1 conducts allowing the A.G.C. voltage to reduce the R.F. gain: a fixed delay is thus provided for A.G.C. to the R.F. stage. At a voltage dependent on the setting of 2RV1, 2MR2 will stop conducting and 2VT1 will amplify at the level fixed by 2RV1. Any further increase in A.G.C. voltage causes 2VDR2 to conduct progressively, by-passing 2MR2 so that an A.G.C. voltage is again applied to the base of 2VT1.

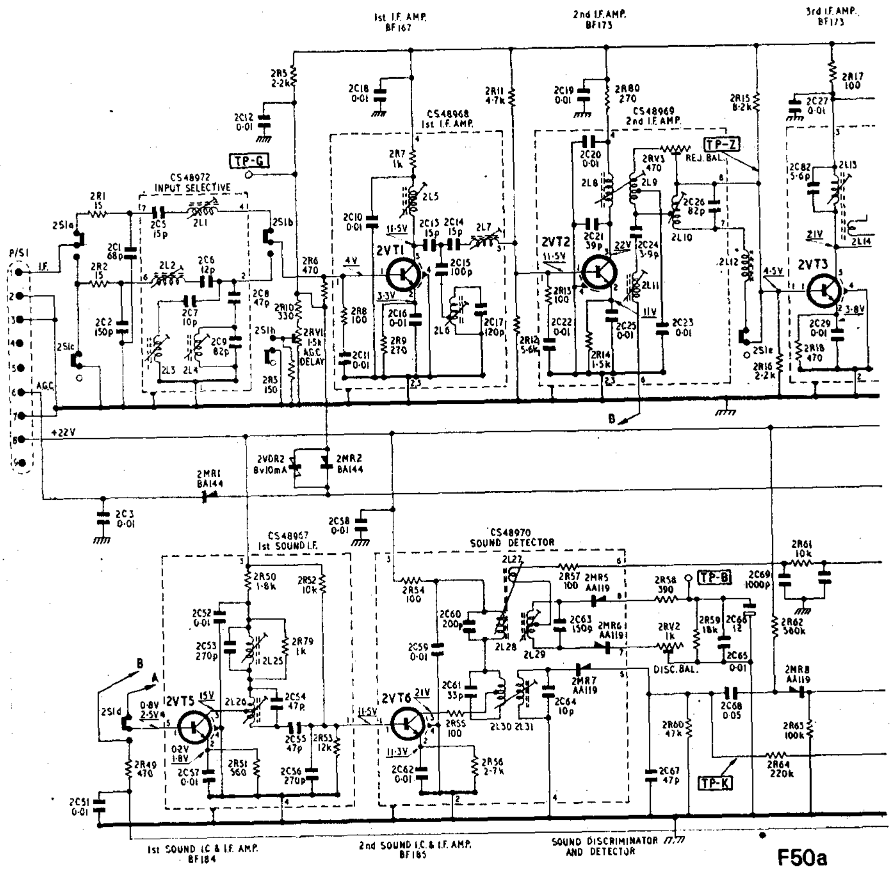
Circuit Information (Black Level Correction): The coupling capacitor 2C41 blocks the D.C. component of the video signal and this would cause the picture black level to vary unless corrected. Video signals from the anode of 2V1a and synchronization signals from the anode of 2V1b are combined at the junction of 2R45 and 2R44. The pulses from the synchronization separator are in opposite phase to and cancel the synchronization pulses on the video

waveform. The resultant waveform consisting of video information only is rectified by 2MR9. The D.C. output is applied to the grid of the video amplifier and counteracts the loss of the D.C. component.



* Insert 10 Ω resistor between 3V2 cathode and chassis.
† Peak voltage depends on setting of 3RV12.

(F49) WAVEFORMS—MODELS TV161U, TV165, TV116U AND TV116C

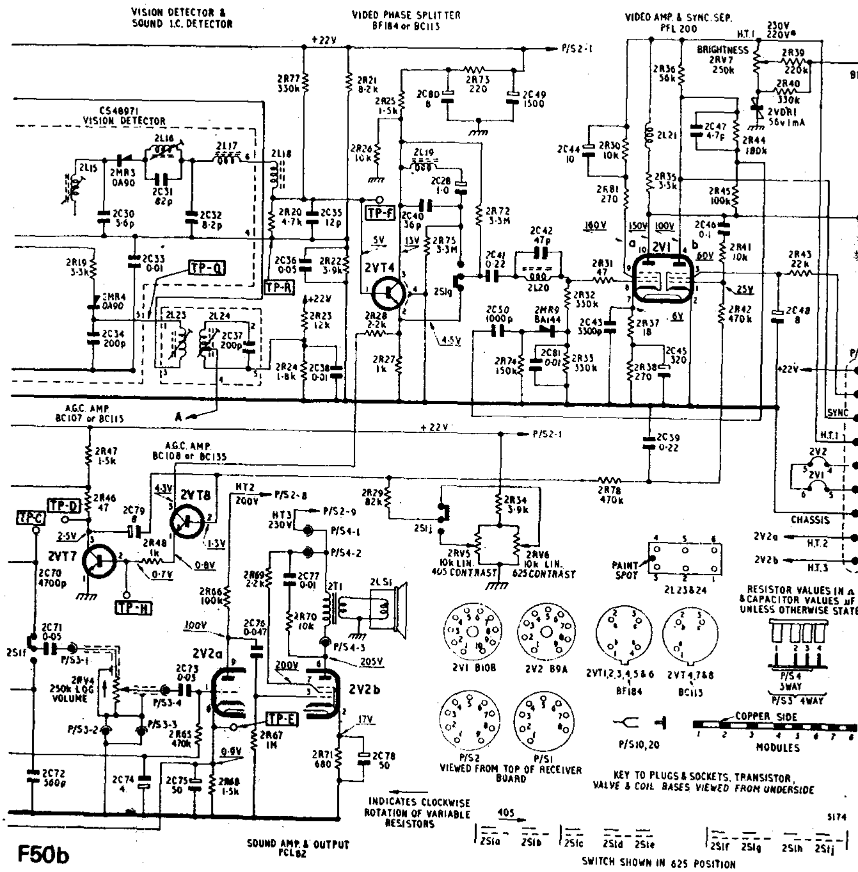


(F50a) CIRCUIT DIAGRAM OF I.F. SECTION—MODELS TV161U, TV165, TV166U AND TV166C (PART)

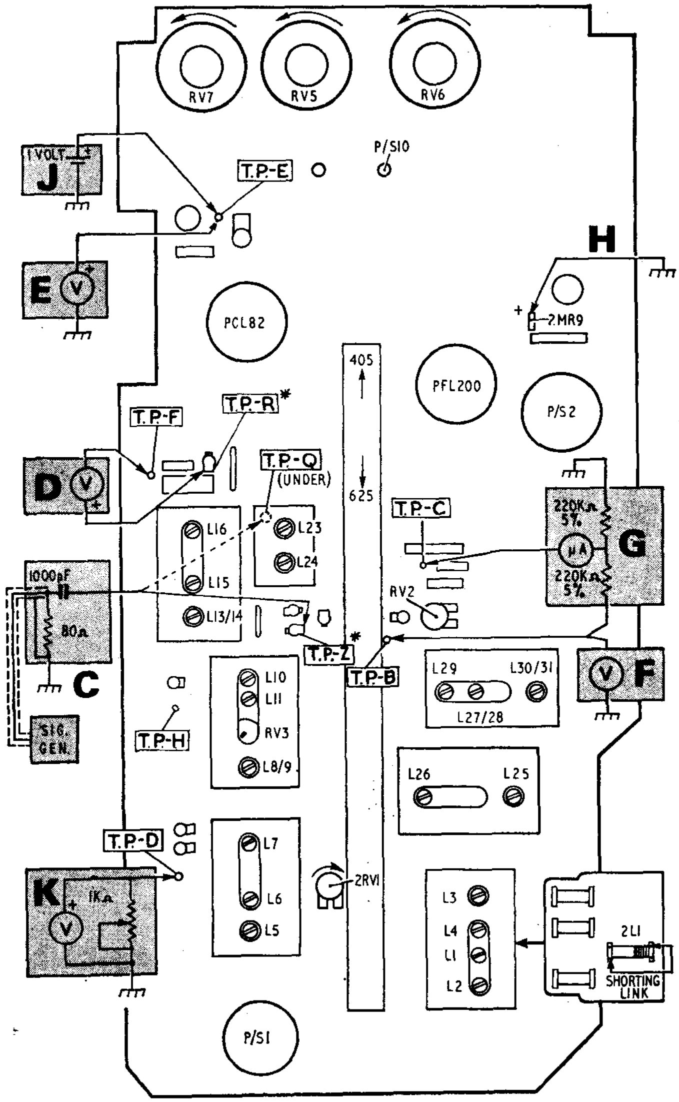
SENSITIVITY

Sensitivity	Bias K	Generator			Meter	
			MHz	Output		Volts
405 vision	o	A	34·65	200 μV	D	>1
405 sound	–*	A	38·15	630 μV	E†	>0·5
625 vision	o	A	39·25	200 μV	D	>1
625 sound	maximum	C‡	6	5 mV	F	>2·5

* Adjust bias K to give 1 V at D with an input of 34·65 MHz, 2 mV.
† Remove the battery J.
‡ Remove C from TP-Z and connect to TP-Q.
Overall Sensitivity: The average sensitivity over any band for 1 V D.C. at the video detector output is 10 μV.



(F50b) Circuit Diagram of I.F. Section (Continued)



F53 *CLIP TO BARED METAL END OF RESISTOR

(F53) Alignment Details—I.F. Unit A583

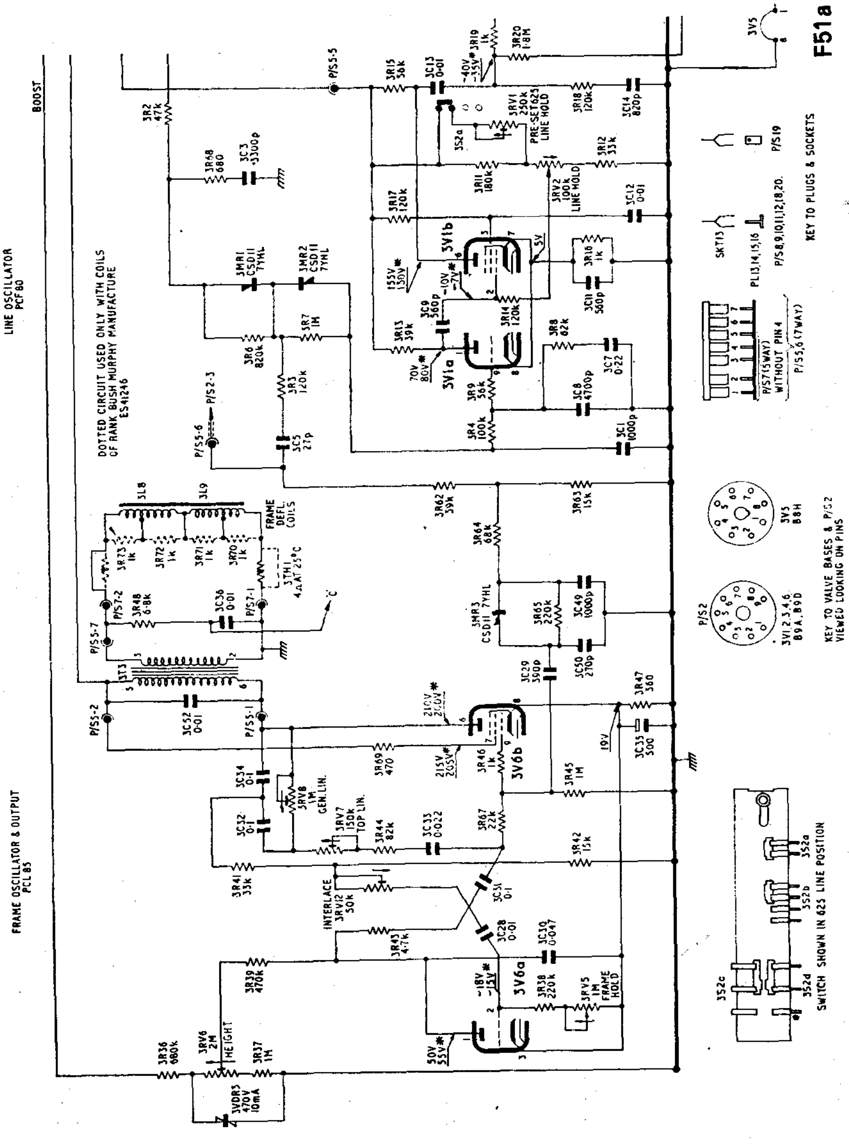
Alignment (General): (*see Alignment Diagrams*) Switch on the receiver and test equipment 15 minutes before starting alignment. Check the 6MHz signal generator with a crystal calibrator. Switch the tuner unit to an unused, interference-free channel in Band I (in Band IV/V for item 15).

Turn fully anticlockwise the two contrast controls (2RV5 and 2RV6) and the brightness control (2RV7). Turn fully clockwise the A.G.C. delay (local/distant) control (2RV1). Disconnect the bowden cable from the system switch lever at the left edge of the chassis and operate the lever by hand, up for 405 lines and down for 625 lines. A trimming tool (AP49981) suitable for the cores in the receiver unit (A583) is available from the service department.

Before starting the vision alignment, unscrew the core of 2L15 to its fullest extent. Maintain the video output D under 2 V by adjusting the signal generator output keeping bias K between 1·5 and 2 V. If the video output is taken from the anode of the video amplifier at P/S10, link H must be connected from the positive end of 2MR9 to chassis: the gain of the video amplifier is approximately 25. Note that video output refers to the increase in output over that corresponding to zero input.

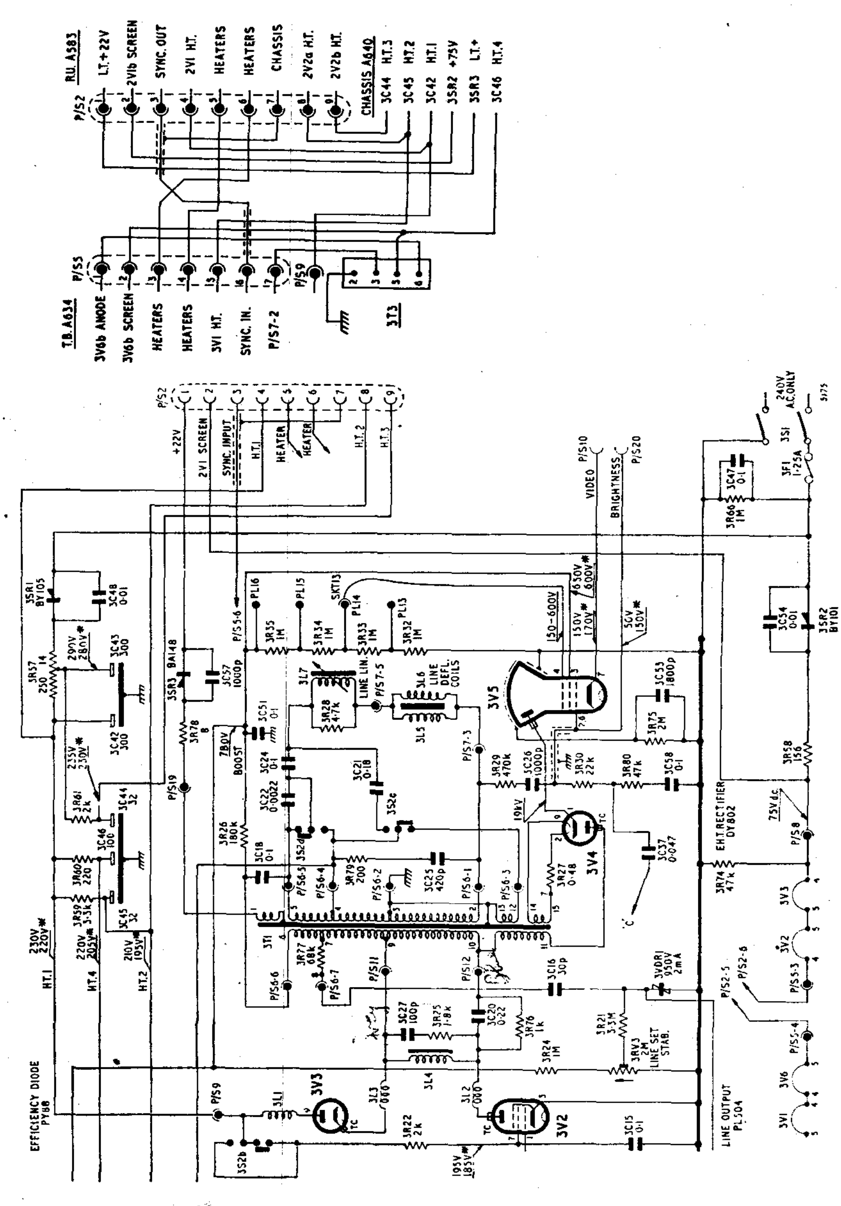
Operation	*Signal generator*	*Frequency (MHz)*	*Switch lever*	*Adjust*	*Meter*	*Output*
	VISION ALIGNMENT		*Bias K = 1·5–2 V. Connect* J			
1	A	33·25	Up	2L16	D	Min.
2	A	38·15	Up	2L10	D	Min.
3	A	38·15	Up	2RV3	D	Min.
4	A	33·15	Down	2L6	D	Min.
5	A	33·15	Up	2L4	D	Min.
6	A	39·65	Up	2L3	D	Min.
7	A	35·4	Up	2L2	D	Max.
8	A	34·65	Down*	2L1	D	Max.
9	A	35·4	Down	2L5	D	Max.
10	A	37·5	Down	2L7	D	Max.
11	A	37·5	Down	2L8/9	D	Max.
12	A	35·4	Down	2L13/14	D	Max.
13	A	37·5	Down	2L15	D	Max.
14	A	37·6	Up†	1L9	D	Max.
15	B	37·6	Down	4L4	D	Max.
	405 SOUND ALIGNMENT		*Bias K = 1·5–2 V. Disconnect* J			
16	A	38·15	Up	2L11	E	Max.
17	A	38·15	Up	2L26	E	Max.
18	A	38·15	Up	2L30/31	E	Max.
19	A	38·15	Up	2L10	D	Min.
20	A	38·15	Up	2RV3	D	Min.
	625 SOUND ALIGNMENT		*Bias K = maximum volts*			
21	C	6	Down	2L27/28	F	Max.
22	C	6	Down	2L25	F	Max.
23	C	6	Down	2L29	G	Zero
24	C	6	Down	2L24	F	Max.
25	C	6	Down	2L23	F	Max.
26	C‡	6	Down	2RV2	L.S.	Min.
27	C	6	Down	2L29	G	Zero

* Damp 1L9.
† Damp 2L1.
‡ Switch to amplitude modulation on signal generator and adjust for minimum sound output from the loudspeaker.



F51a

(F51a) Circuit Diagram of Timebase Section—Models TV116U, TV165, TV166U and TV166C (Part)



F51b

(F51b) Circuit Diagram of Timebase Section (Continued)

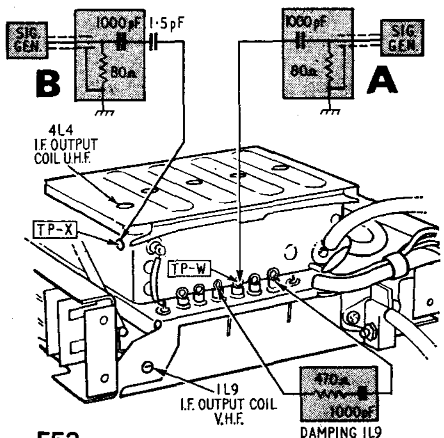
Alignment (Spot Frequency I.F. Check Procedure): (*see Alignment Diagrams*) Set the frequency of the signal generator A (6·3 mV) to the peak of the response curve; this should be 37·25 MHz on 625 lines and approximately 36·5 MHz on 405 lines. Adjust the bias K to give 2 V (100 per cent) on meter D. Now adjust the signal generator to the frequencies shown at the top of I.F. response curves. Check at each frequency that the output on meter B is within the limits given on these response curves.

The selectivity at frequencies outside the passband is compared with the response at the carrier frequency. A suitable reference level is obtained by adjusting the bias K to give 1 V output at D for an input of 2 mV at 34·65 MHz (405 lines) or 630 μV at 39·25 MHz (625 lines). Without changing the bias level, the response at 33·15 MHz on 405 lines for example should then be less that 0·1 V for an input of 63 mV.

This means that a signal input which is 30 times greater should produce a video output which is 10 times less, an overall reduction in response of 300 times (50 dB).

Note: —26 dB, —42 dB and —50 dB are voltage ratios of 1/20, 1/125 and 1/300 approximately.

The selectivity at 41·25 MHz is pre-set at the factory by adjusting the turns spacing of 2L10, the 38·15 MHz rejector.



F52

(F52) ALIGNMENT DETAILS—TUNER UNIT A633

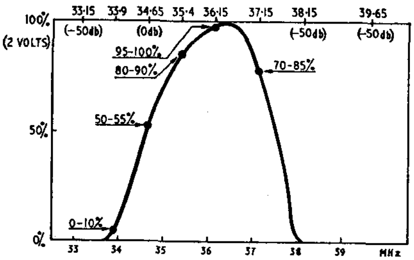
Circuit Diagram Notes: Voltage Conditions: 1. Mains input 240 V A.C. 2. Small signal applied. 3. Contrast control set for a normal picture. 4. Normal picture width and height. 5. Avo model 8, used on appropriate Range. 6. Voltages marked * taken on 625. 7. All voltages are positive with respect to chassis.

Frame Hold Note: Frame slip may be caused by a short circuit in 3SR2, the heater supply rectifier. See Circuit Information (heater supply).

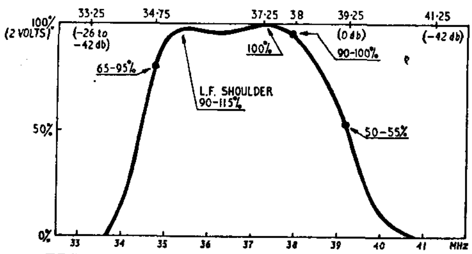
I.F. Response Curves Note: The frequency marker "pips" on the I.F.

response curves are those obtained when using R.B.M. sweep and marker generator, type 12050.

Modifications (V.H.F. Tuner Unit A633): 1. Early models may not have the ferrite bead fitted between 1R19 and 1C31 to prevent spurious oscillation on Band III. 2. On the circuit diagram note that 1R2, 1C6, 1C27 are mounted outside the screening box. 3. On early models, 2C7 (10pF) was 18pF and 2L3 (BS52262) was BS49477). The change increases sound output on 405. 4. 2MR1 (BA144) may be the similar type BA146. 5. On early models 2RV1 (1·5k) was 1k.



F54



F55

Left: (F54) VISION I.F. RESPONSE—405-LINE OPERATION. *Right:* (F55) VISION I.F. RESPONSE—625-LINE OPERATION

Modifications (Receiver Unit A583): 1. Some models may not have 2R80 (270Ω) and 2R81 (270Ω) which have been fitted to prevent failure of 2VT2 and 2VT4 due to tube or valve flashover. 2. On early models 2R3, 2R27, 2R72, 2R75 and 2R77 were mounted on the printed side of the panel.

Modifications (Timebase Unit A634): 1. On early models, 3R21 (3·3M) and 3R24 (1M) were 2·2M. The change increases the range of the line stability control. 2. On early models, 3R68 (680Ω) was 470Ω. The change improves line phasing. 3. On early models, 3C21 (0·18μF) was 0·22μF. The change improves line linearity on 405.

BUSH

Models TV171, TV175, TV176 and TV178

General Description: All these models are electrically similar to later models of the TV161 Series (described in this volume), but the extra information given below must be noted.

I.F. Unit Type A583: 1. Diode 2MR3, type BA144 is replaced by a BA164. 2. Resistor 2R21 is 10k ±10 per cent, on later models, to allow for operating tolerances in 2VT4, BC113. 3. An R.F. choke, 2L32 is inserted between pin 4 of 2L24 and 2S1d to filter the I.F. frequency from the intercarrier amplifier.

4. A filter consisting of R.F. choke 2L33 and capacitor 2C83, 10pF ±5 per cent. 750V, silvered ceramic is added in series between the 405 contact of 2S1e and chassis.

Timebase Unit Type A634: The diodes 3MR1, 2 and 3 formerly supplied as one unit, now employ three separate diodes, type BA144. In addition 3MR1 and 3MR2 each have an 18k resistor added in series with their anodes. These two resistors become 3R49 and 3R50 respectively.

Note on the Fitting of Rimguard Tubes to Models TV175: The face of these tubes projects through the cabinet aperture. In order to prevent the metal band surrounding the tubes from fouling the rear of the baffle, spacing washers are fitted between the tube mounting lugs and the wooden cabinet blocks.

When replacing or refitting a C.R.T. lay the receiver face downwards, with the cabinet resting on suitable supports so that the tube face is clear of the bench. Check the gaps (if any) between the lugs and the cabinet blocks and fit the spacing washers as follows: If no gap exists between each lug and the cabinet block, fit one washer. If space exists for the thickness of one washer fit two, likewise if space exists for two, fit three washers.

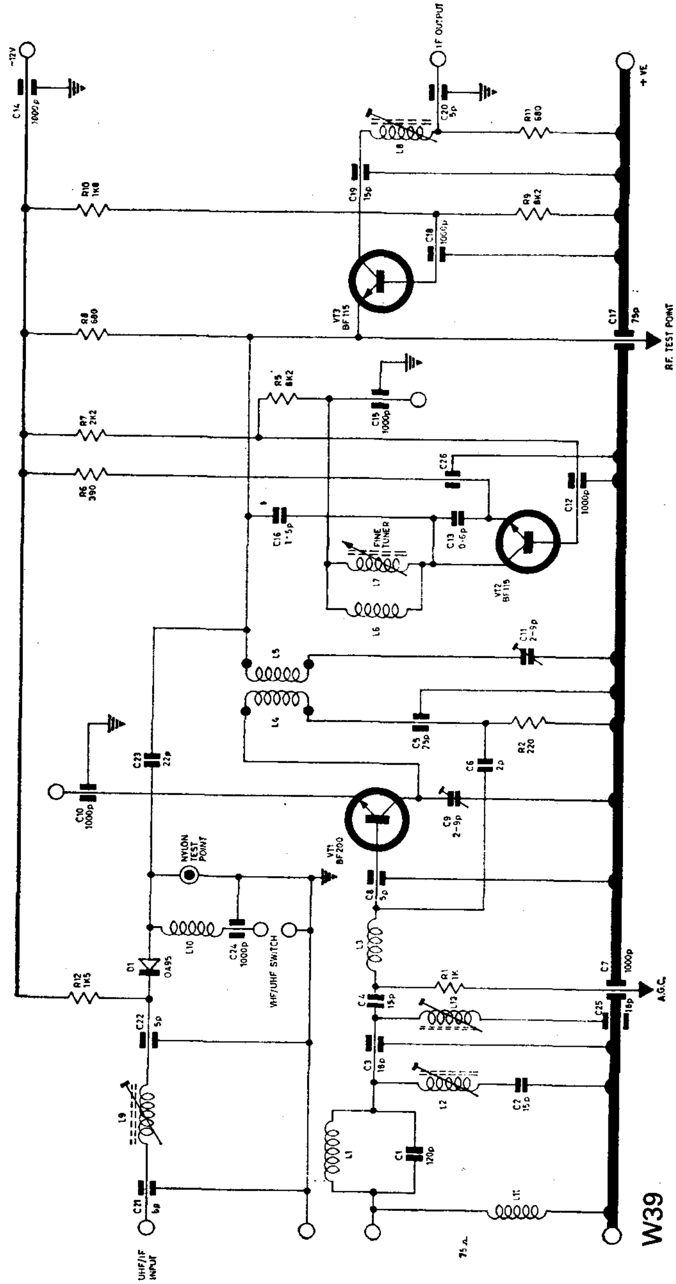
Alternative C.R.T. Base: Some models employ tubes of the "Ringtrap" type. These models are fitted with an alternative type of tube base connector and may be identified by an additional earthing connection between pins 5 and 8.

EKCO — Models T520 and T521

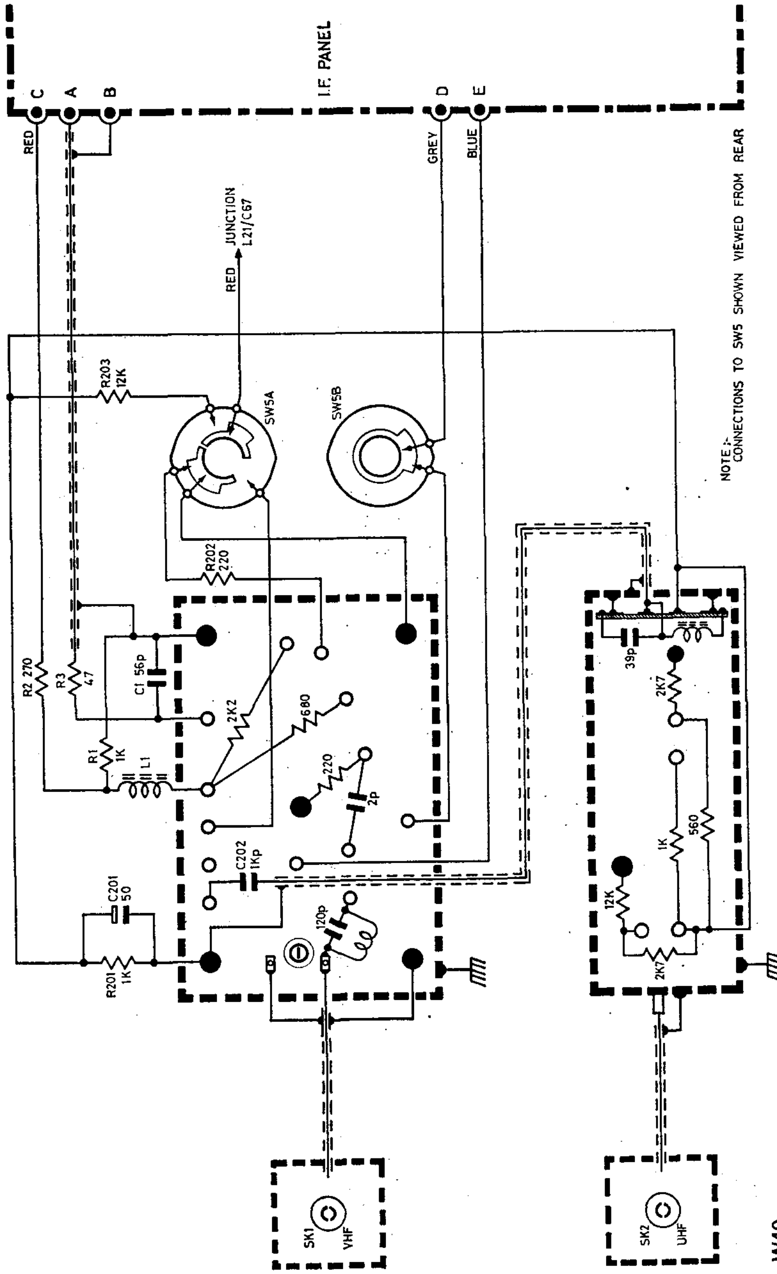
General Description: The chassis incorporated in these models is similar to the Pye 368 chassis, which is described in this volume.

EKCO — Models T524 and T525

General Description: The chassis incorporated in these models is electrically similar to the Pye 368 chassis, which is described in this volume, with the exception of the multiband tuner. This is replaced by separate V.H.F. and U.H.F. rotary tuners. The accompanying diagrams on the following two pages indicate the differences.



(W39) Circuit Diagram—V.H.F. Tuner—Ekco T524/5

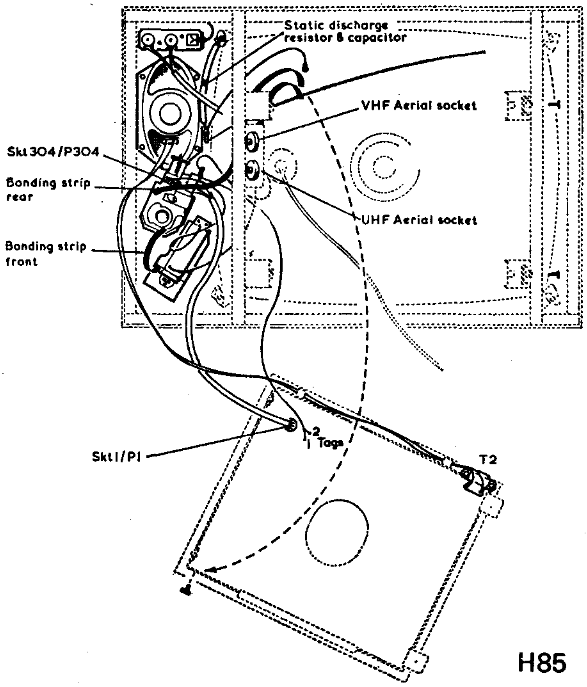


(W40) INDEPENDENT TUNER CONNECTIONS—ECKO T524/5

FERGUSON Model 3647

General Description: 23-in. television receiver with tuners and chassis adapted from the BRC1400 Series, which is described in the 1968–69 volume.

Access for Service: Remove cabinet back (five screws). Release chassis from right-hand mounting brackets (two screws). The chassis can be hinged open or lifted off its hinges for complete accessibility. The illustration (H85) shows the main chassis lifted off after releasing the tuner bonding strip and C.R.T. earth (one screw). This enables all interconnections to be shown.



(H85) Interconnections Diagram—Model 3647

Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released from cabinet as described in 1400 Series information, but, in addition free the following: 1. Bonding strip (rear) from V.H.F. tuner (one screw). 2. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. V.H.F. aerial socket (three screws) and socket earth lead. 4. SKT304 from P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T8): Pull off tuning knob and indicator ring assembly. Remove two self-tapping screws to release the bracket assembly and front bonding strip. In addition free the following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off knobs and release assembly (two screws). If necessary, free mains lead from cleats.

Dismantling Loudspeaker: Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (four screws).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain. 1. E.H.T. anode connector and tube base connector (including spark gap earth). 2. Deflector coils (including linearity sleeve) secured by moulded clamp. 3. C.R.T. earthing spring.

Dismantling C.R.T.: Remove both cabinet vertical support struts and swing aside chassis assembly for easy access. Then proceed as described in 1400 Series information. Note that static discharge resistor and capacitor must be repositioned between C.R.T. rim and earth connection.

FERGUSON Model 3652

General Description: 19-in. television receiver with tuners and chassis adapted from the BRC1400 Series, which is described in the 1968–69 volume.

Access for Service: Remove cabinet back (four screws). The chassis can be hinged open after taking out two screws from right-hand mounting brackets. By releasing the bonding strip to aerial socket panel and C.R.T. earthing lead from chassis frame (one screw), and volume control earthing lead from aerial socket panel, the chassis can be lifted off its hinges as described in 1400 Series information and laid flat on workbench after freeing leads from cleats along left-hand edge of chassis. The illustration (H86) shows the chassis lifted off its hinges enabling all interconnections to be seen. This is also a necessary preliminary to C.R.T. replacement.

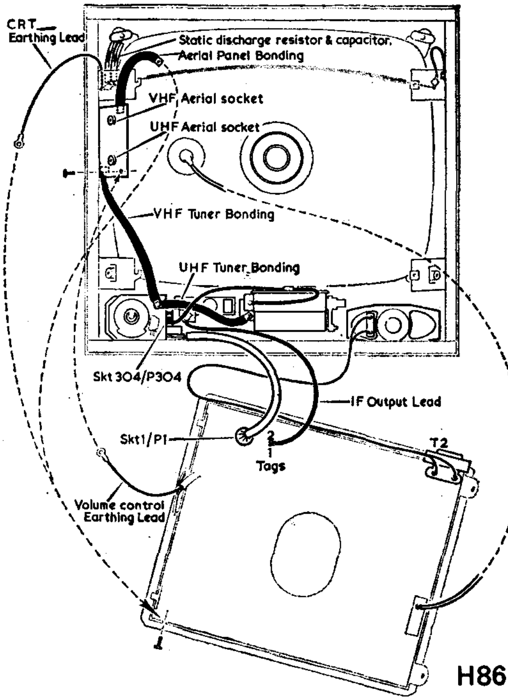
Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released from cabinet as described in 1400 Series information, but, in addition free the following: 1. Bonding strips from V.H.F. tuner (one screw). 2. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. V.H.F. aerial socket (three screws) and socket earth connection. 4. SKT304 from P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T4): Remove two red nylon nuts to release the tuner and bonding strip. In addition free the following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off knobs and release assembly (two white nylon nuts). If necessary, free mains lead from cleat.

Dismantling Loudspeaker: Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (three P.V.C. end caps).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain. 1. E.H.T. anode connector and tube base connector. 2. Deflector coils (including linearity sleeve) secured by moulded clamp.



(H86) Interconnections Diagram—Model 3652

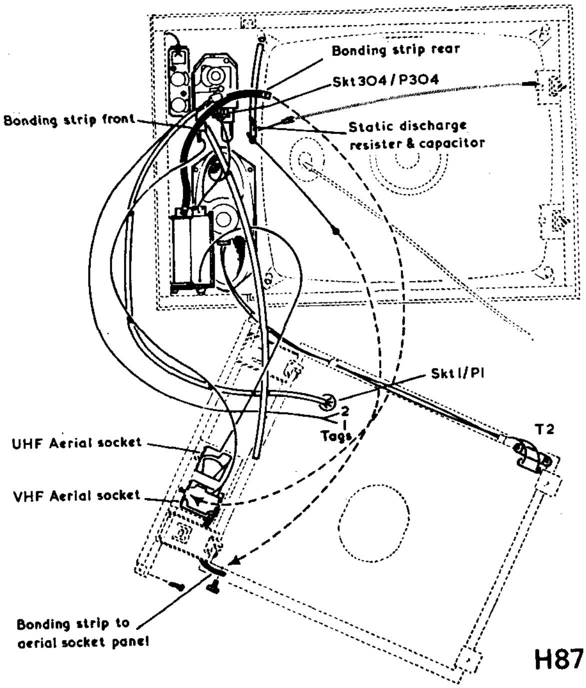
Dismantling C.R.T.: Place receiver on its right-hand side on a grit free resilient surface and open chassis to lay flat on workbench. Remove U.H.F. tuner. Take off E.H.T. anode connector, tube base connector and deflector coils assembly. Unhook C.R.T. earthing spring from tag and release four nuts and washers to release tube and static discharge components, then withdraw tube from cabinet. See also Cathode Ray Tube notes in 1400 Series information. When refitting new tube ensure that the E.H.T. anode connection is towards the left-hand side of cabinet, and that discharge components are correctly positioned under washer and nut at top left-hand tube mounting, also the C.R.T. earthing spring is reconnected to the tag provided.

Note: Ensure that all bonding strips are correctly connected when refitting assemblies.

FERGUSON Model 3653

General Description: 19-in. television receiver with tuners and chassis adapted from the BRC1400 Series, which is described in the 1968–69 volume.

Access for Service: Remove cabinet back (five screws). The chassis can be hinged open by releasing two screws from right-hand mounting brackets, or for complete accessibility, lifted off its hinges as described in 1400 Series information, after removing chassis bonding strip and C.R.T. earthing lead. Diagram H87 shows the vertical support strut freed from the cabinet (two screws) and tuner bonding strip released from V.H.F. aerial socket panel (one screw), also C.R.T. earthing lead released from chassis (one screw). All interconnections are to be seen and is a necessary preliminary to C.R.T. replacement.



(H87) Interconnections Diagram—Model 3653

Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released from cabinet as described in 1400 Series information, but, in addition free the following: 1. Bonding strips (rear) from V.H.F. tuner (one screw). 2. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. Release lead from V.H.F. aerial socket. 4. SKT304 from P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T4): Remove two self-tapping screws to release tuner from cabinet. In addition free the following: 1. SKT304 from P304 (V.H.F.) tuner. 2. U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off knobs and release assembly (two self-tapping screws). If necessary, free mains lead from cleat.

Dismantling Loudspeaker: Remove U.H.F. tuner. Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (four screws).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain. 1. E.H.T. anode connector and tube base connector. 2. Deflector coils (including linearity sleeve) secured by moulded clamp.

Dismantling C.R.T.: Disconnect C.R.T. earthing spring and static discharge components and then see BRC1400 Series information.

Note: Ensure that all bonding strips are correctly connected when refitting assemblies, also static discharge resistor and capacitor must be re-positioned between C.R.T. rim and earth connection.

FERGUSON Model 3654

General Description: 23-in. television receiver with tuners and chassis adapted from the BRC1400 Series, which is described in the 1968–69 volume.

Access for Service: Remove cabinet back (four screws). The chassis can be hinged open after releasing two screws from right-hand mounting brackets. By releasing the bonding strip to aerial socket panel and C.R.T. earthing lead from chassis frame, also the volume control earthing lead from aerial socket panel, it can be lifted off its hinges as described in 1400 Series information. Diagram H88 shows the chassis lifted off its hinges, enabling all interconnections to be seen. This is a necessary preliminary to C.R.T. replacement.

Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released from the cabinet as described in 1400 Series information, but, in addition free the following: 1. Bonding strip from V.H.F. tuner (one screw). 2. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. V.H.F. aerial socket (three screws) and socket earth lead. 4. SKT304 from P304 (V.H.F. tuner).

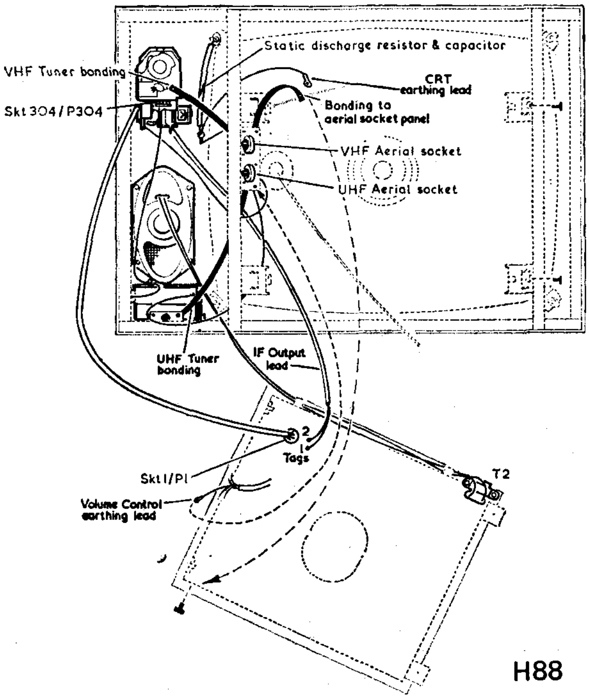
Dismantling U.H.F. Tuner: Take off U.H.F. tuner bonding strip from aerial socket panel. To remove tuner assembly slacken off nut and washer securing tuner to wooden block, then raise rear of tuner to clear fixing screw. In addition free the following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off knobs and release V.H.F. tuner. Take out two screws securing assembly and, if necessary, free mains lead from cleat. This is also a necessary requirement for releasing the

control panel moulding and escutcheon, which can be freed by taking out four screws and washers securing it to the front moulding assembly.

Dismantling Loudspeaker: Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (four screws).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain. 1. E.H.T. anode connector and tube base connector. 2. Deflector coils (including linearity sleeve) secured by moulded clamp.



(H88) Interconnections Diagram—Model 3654

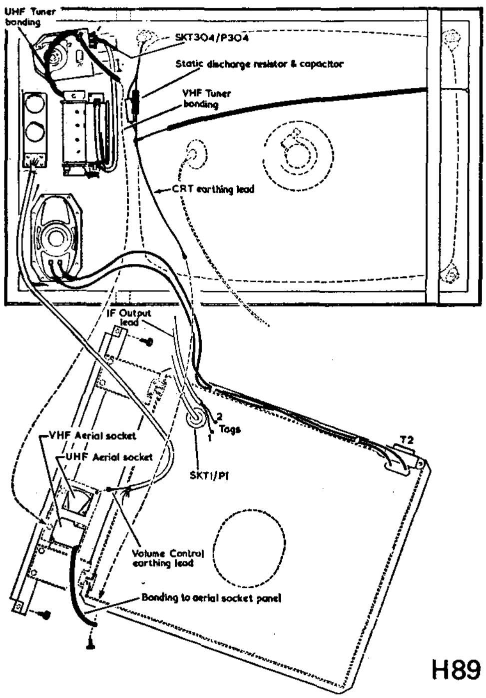
Dismantling C.R.T.: Free the main chassis from the hinges after disconnecting the appropriate leads. Unscrew the two vertical cabinet struts to provide tube removal clearance and unhook one end of the C.R.T. earthing spring. Note discharge components secured under top left-hand tube fixing screw.

Note: When refitting assemblies ensure that all bonding strips are correctly connected and that static discharge resistor and capacitor are repositioned between C.R.T. rim and earth.

FERGUSON Model 3655

General Description: 23-in. television receiver with tuners and chassis adapted from the B.R.C.1400 Series, which is described in the 1968–69 volume.

Access for Service: Remove cabinet back (four screws). The chassis can be hinged open after removing two screws securing it to the right-hand mounting brackets. For complete accessibility detach the aerial panel bonding strip and C.R.T. earthing lead from top left-hand corner of chassis, release the volume



(H89) Interconnections Diagram—Model 3655

control earthing lead from lower corner of aerial socket panel and lift the chassis off its hinges as described in 1400 Series information. Diagram H89 shows the main chassis, freed from cabinet, after releasing one of the vertical support struts; aerial bonding strip, C.R.T. earthing lead and volume control earthing lead disconnected. Also shown are tuner bonding strips and plug and socket connections between chassis and rest of receiver.

Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released from cabinet as described in 1400 Series in formation, but, in addition free the following: 1. V.H.F. and U.H.F. tuner bonding strips from tuner (one screw).

2. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. V.H.F. aerial socket (three screws) and earthing link. 4. SKT304 from P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T4): Remove two red nylon nuts to release tuner from cabinet. In addition free the following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off knobs and release assembly (two white nylon nuts). If necessary free mains lead from cabinet cleat.

Dismantling Loudspeaker: Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (four P.V.C. end caps).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain. 1. E.H.T. anode connector and tube base connector. 2. Deflector coils (including linearity sleeve) secured by moulded clamp.

Dismantling C.R.T.: With the chassis removed, unscrew the remaining vertical cabinet strut to provide tube removal clearance. Unhook one end of the C.R.T. earthing spring, then see 1400 Series information. Note static discharge components fixed under top left-hand tube fixing nut.

Note: When refitting assemblies ensure that all bonding strips are correctly connected and that static discharge resistor and capacitor are repositioned between C.R.T. rim and earth.

FERRANTI

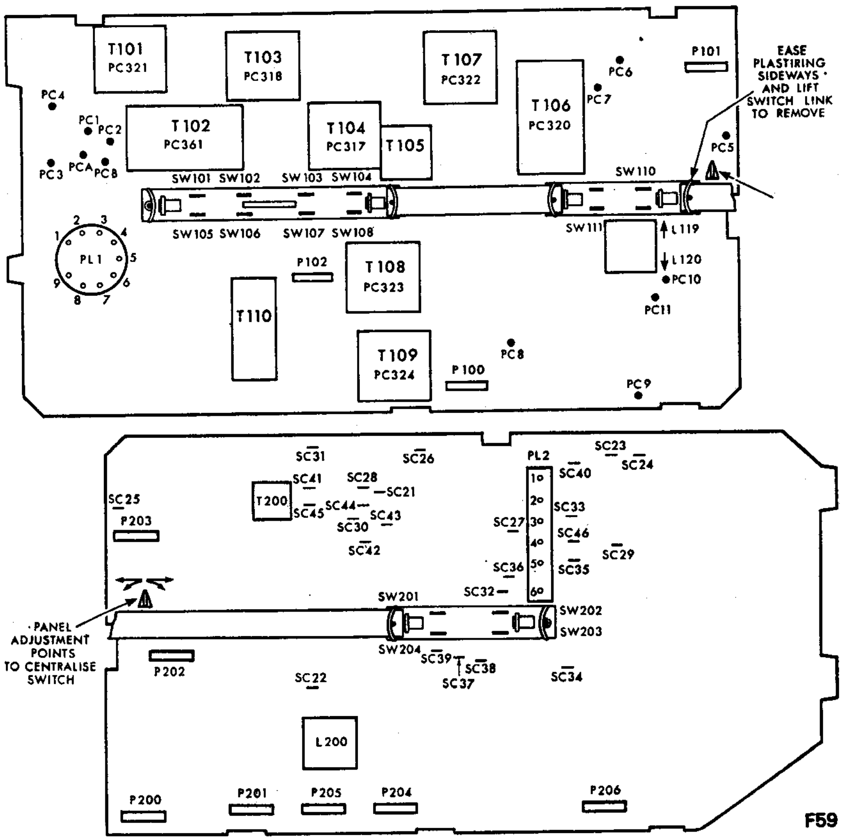
Models T1173, T1174, T1175 and T1176

General Description: The chassis incorporated in these models is similar to the Pye 368 chassis, which is described in this volume.

G.E.C. Models 2032 and 2033

General Description: These models are fitted with a four-band integrated tuner, which can be pre-set to give any required combination of Band I, Band III, Band IV and Band V channels on 405- or 625-line systems. Three transistors are used in the tuner, plus eight transistors and seven valves in the two plated circuit panels (I.F. amplifier and timebase) of the receiver, together with a 110 degree deflection cathode ray tube.

Top	L104	L101	L106	L108	L110	L112	L130	L128	L126	L122
Bottom	L103	L102	—	L107	L109	L111 L113 SIDE	—	L127	L125	L123 L135
Ass'y No.	T101	T102	T103	T104	T105	T106	T107	T108	T109	T110



F59

(F59) Top Side (*left*) and Printed Side (*right*) of I.F. Board Showing Alignment Details —Models 2032/2033. Note that the Panel Adjustment Points, Indicated on Left of Lower Part of Diagram, Also Apply to the Right of the Top Part of Diagram

Coverage: V.H.F. channels 1–13 on the 405- or 625-line systems. U.H.F. channels 21–68 on the 625-line system.

Intermediate Frequencies: 405: Vision 34·65 MHz. Sound 38·15 MHz. 625: Vision 39·4 MHz. Sound 33·4 MHz.

Intercarrier Sound I.F.: 625: 6 MHz.

Mains Input: 210–250 V A.C. 50 Hz only.

Power Consumption: 150 W approximately.

Aerial Input: V.H.F. and U.H.F. 70 Ω.

Loudspeaker: 5-in. circular, 3 Ω impedance.

Cathode Ray Tube: 2032: 19 in., 110 degrees, A47-26 W/R. 2033: 23 in., 110 degrees, A59-23 W/R.

Valves:

V1a/b	PFL200	Video output and synchronization separator
V2a/b	PCL86	Sound amplifier and output
V3a/b	PCL85	Field oscillator and output
V4a/b	PCF802	Line timebase oscillator
V5	PY800	Boost diode
V6	PL504	Line timebase output
V7	DY87	E.H.T. rectifier

Germanium Diodes:

D100	OA91	A.G.C. peak detector
D101	OA90	Vision detector
D102	BA115	D.C. restoration
D103	OA91	Noise limiter
D104	AA119	A.M. detector
D105	AA119	F.M. detector
D106	AA119	F.M. detector
D107	OA90	6 MHz intercarrier detector
D200	OA91	Field pulse gate diode

Selenium Diodes:

D201A, D201B	FSY41A	Flywheel synchronization detector

Transistors:

TR101	BC187	2nd A.G.C. amplifier
TR102	BF196	1st common I.F. amplifier
TR103	BC148	1st A.G.C. amplifier
TR104	BF197	2nd common I.F. amplifier
TR105	BF197	Vision I.F. amplifier
TR106	BC187	Video amplifier
TR107	BF194	1st sound I.F. amplifier
TR108	BF194	2nd sound I.F. amplifier

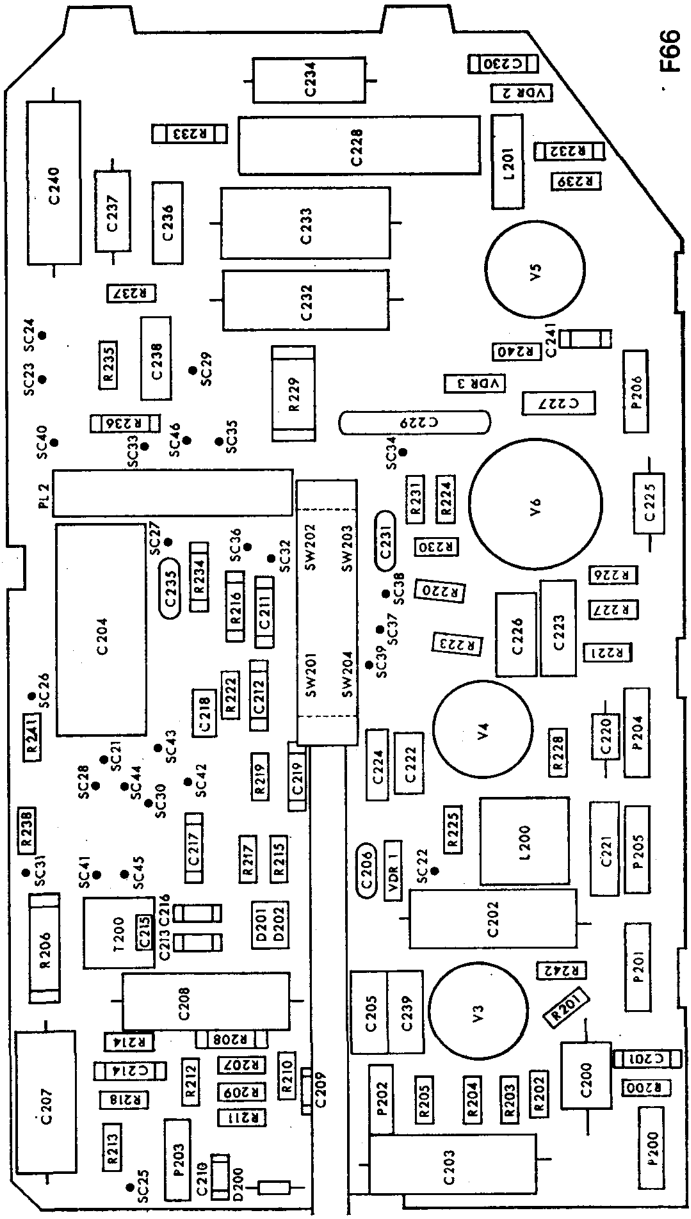
Silicon Junction Diodes:

D301	BY127	Heater rectifier
D302	BY127	H.T. rectifier

Access for Service: Servicing can normally be carried out with the chassis in the cabinet since the majority of components are readily accessible once the cabinet back is removed. In addition, by loosening the 2 × 4BA head PK fixing screws, the chassis can be removed from the cabinet, after releasing the system switch operating linkage, to the extent of the connecting leads. The leads and connections can, of course, be disconnected if further dismantling is required. To disengage the system switch, release the rod securing clip. This method of disengagement avoids resetting the system switch on re-assembly.

Removal of Tuner: To remove (from the cabinet). Disconnect and remove chassis and system switch as detailed above. Remove the fixing at the side steady bracket, and undo the four 4BA screws securing the tuner to the inside of the escutcheon.

Removal of Scanning Coil Assembly: Remove the C.R.T. base connector panel and the connector plug from the timebase panel. Slacken the clip securing the assembly to the tube neck, and withdraw carefully, taking special care not to damage the linearity sleeve.



(F66) Component Locations—Timebase Panel—Models 2032 and 2033

Removal of Line Scan Transformer: Unclip the leads from the side of the screening cover. Loosen the two fixing screws and remove the screening cover. Take off the E.H.T. and top cap connectors, and remove the PL504, and PY800 if thought necessary. Unsolder the leads to the transformer, taking note of the colour coded connections. Remove line output transformer complete with mounting bracket.

Removal of C.R.T.: If it is necessary to replace the C.R.T. it must be replaced by one of the same type, i.e. employing internal flash-over protection. Failure to do so could cause premature transistor failure. The lugs on the rim guards of the C.R.T. are secured to the cabinet by four 0BA bolts and nuts, and there are knurled nuts to allow for slight discrepancies in tolerances. When fitting a new "P" tube make sure that the front of the C.R.T. is a close fit to the escutcheon.

Adjustments (Mains Supply): Check that mains adjustment is set to the nominal value of the mains supply voltage.

Adjustments (Picture Centring): Rotating the two ring magnets situated at the rear of the scanning coil assembly, either together or separately, moves the display horizontally or vertically into the correct position.

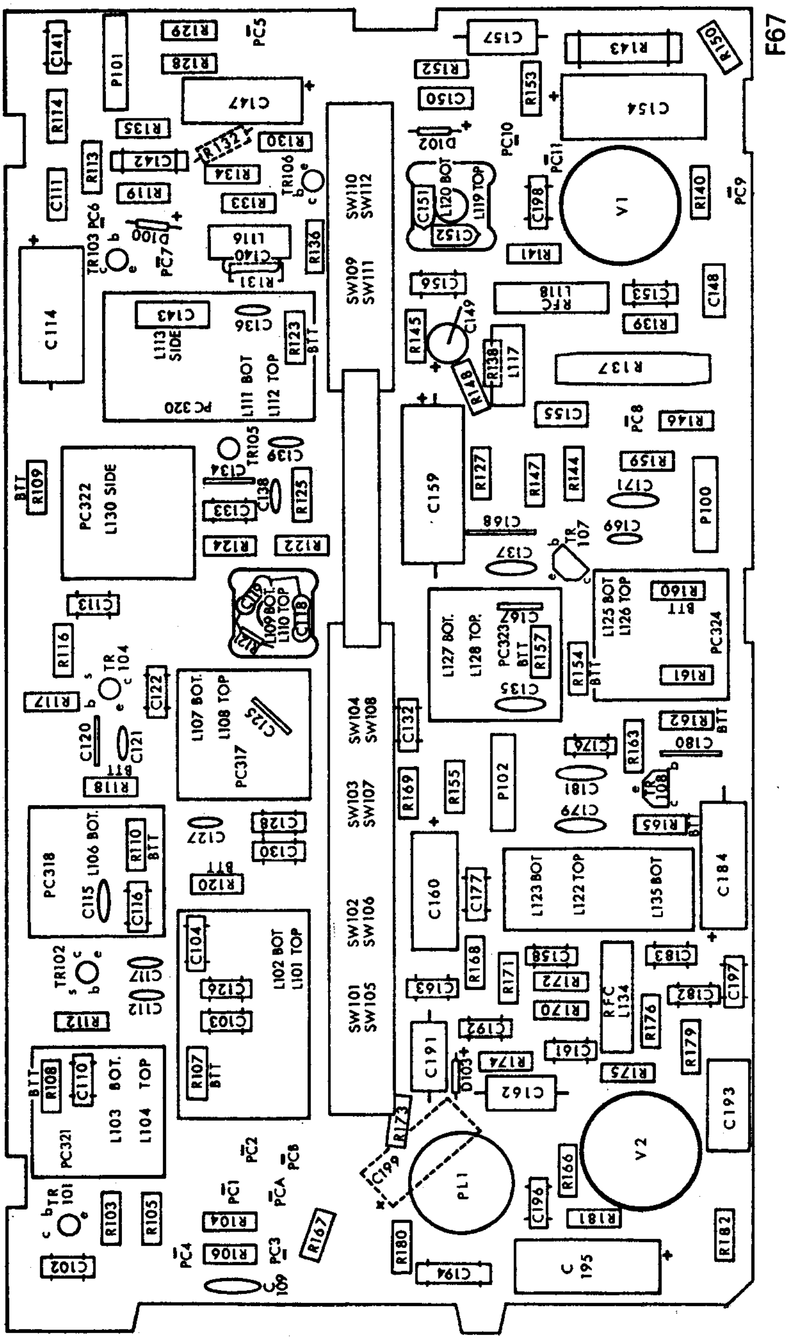
Adjustments (Focus): Four taps and a fly lead are provided on the C.R.T. base socket panel, to alter the potential applied to the C.R.T. focus electrode.

Adjustments (Vertical Linearity): Linearity at the top of the scan may be adjusted by means of a pre-set potentiometer P202. Over the remainder of the scan, linearity may be adjusted by the pre-set potentiometer P203.

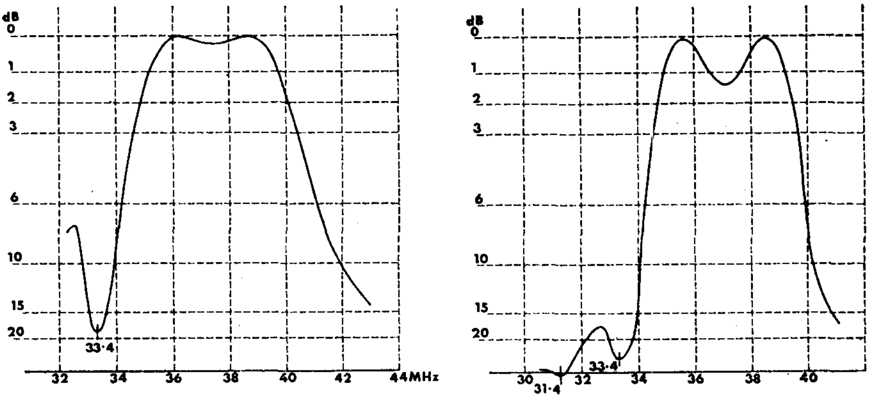
Adjustments (Horizontal Linearity): This is corrected by means of a "shorted-turn" device placed between the scan coils and the neck of the C.R.T. The device is set in a paper sleeve having a bakelite ring cemented at one end for adjustment purposes. Further insertion (towards the bulb of the C.R.T.) contracts the left-hand side of the picture, and withdrawal towards the C.R.T. base socket, expands the left-hand side of the picture. Move the "sleeve" in or out until linearity is better than 5 per cent, but do not over insert, as this will reduce the width and cause overheating of the scan coils. The index on the adjusting ring should always be set in the "three o'clock" position.

Adjustments (Width): The correct width of the picture is determined by the setting of the "set boost" control, which is a rotary pre-set control situated on the timebase panel. It is adjusted as follows: With the receiver operating on the 405-line system and with the mains input tapping correctly adjusted, adjust the "set boost" control for minimum voltage between the junction of C228/R232 and chassis (set meter to read 1000 V or higher). Adjust the line linearity sleeve for optimum line linearity as described above, then advance the "set boost" control for a reading of 770 V, and the width should then be correct. Small variations may be made by further adjustment of the "set boost" control, but the boost voltage must be re-checked after each adjustment and must be within the range 750–790 V. Once the width has been set in this manner it is self-compensating for mains supply voltage variations.

WARNING: Damage will be caused to the line output stage if the boost voltage is outside the limits specified above.



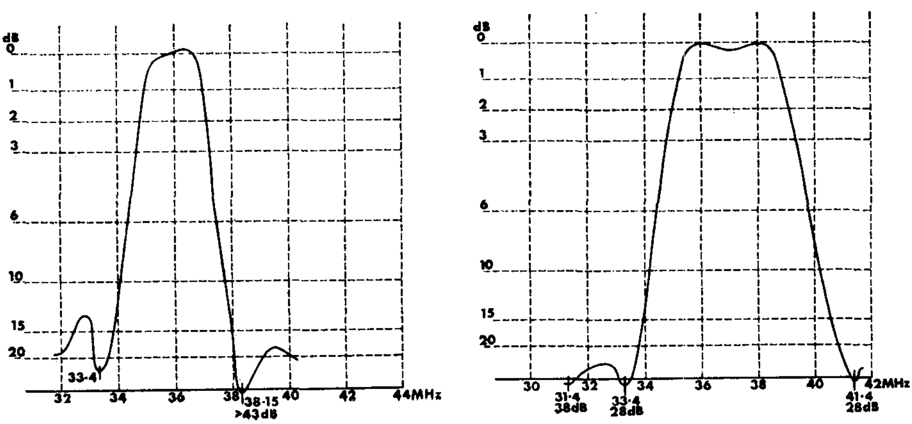
(F67) Component Locations—I.F. Panel—Models 2032 and 2033



F60

(F60) *Left:* Curve A—Vision Detector Stage Response 405/625. *Right:* Curve B—Vision Stage Response 625

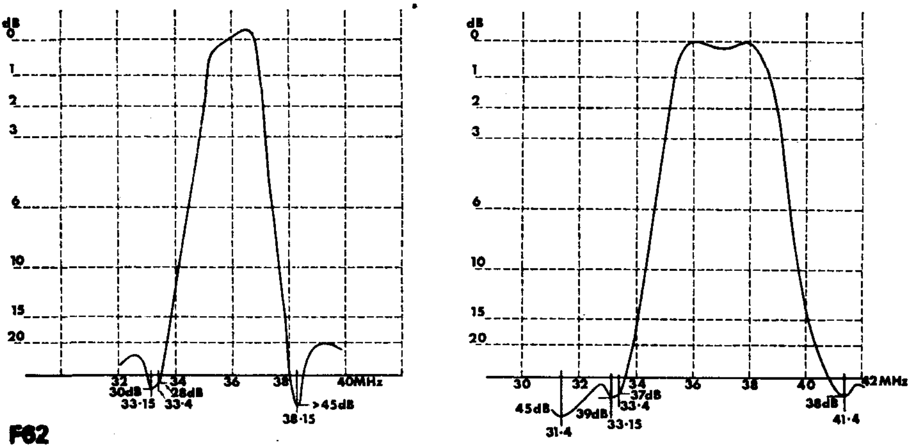
Adjustments (Pre-set Line Hold Control): Normally it will not be necessary to adjust the core of L200, but if the component is changed, the method of setting up is as follows: 1. Set the system switch to 625 and the U.H.F. tuner to a blank channel. 2. Set the 625-line hold control P204 to give 2 V positive between slider and chassis. 3. Adjust the core of L200 so that when a U.H.F. signal is tuned in, the picture locks instantaneously. Check that the same results are obtained with a 405-line transmission. This should occur with P205, the 405-line hold control, approximately in the middle of its travel. Should this not be the case, it may be necessary to slightly readjust L200. In the absence of a 625-line transmission, set the receiver to a 405 position with an appropriate V.H.F. signal applied to the aerial socket. Tune in the signal, adjust L200 for instantaneous locking on this transmission with P205 in the centre of its travel.



F61

(F61) *Left:* Curve C—Vision Stage Response 405. *Right:* Curve D—Input Stage Response 625

Adjustments (Pre-set Contrast Controls): Switch to 405 and turn the manual contrast control to minimum. Adjust the pre-set contrast control P101 for a weak picture, then advance the manual contrast control for a normal picture. Switch to 625 and adjust the balance pre-set contrast control P100 to match the contrast setting on 405.



F62

(F62) *Left:* Curve E—I.F. Input Stage Response 405. *Right:* Curve F—Overall I.F. Response 625

Adjustments (Other Controls): The vertical hold and 405 and 625 horizontal hold controls are located at the rear of the receiver together with the pre-set height control. Brightness, contrast, volume and on/off switch are on the front of the receiver as are the V.H.F. and U.H.F. tuning controls.

VOLTAGE AND CURRENT MEASUREMENTS

(All measurements taken with 245 V A.C. 50 c/s input. Receiver on 245 V tap)

Transistors		*Collector (V)*	*Emitter (V)*	*Base (V)*	*Collector (I)*
TR101	BC187	3·0V*	18V*	19V*	0mA
TR102	BF196	19·2*	4·2*	4·8*	7
TR103	BC148	4·8*	4·8	5·5	9·5
TR104	BF197	14·2	3·5	4·3	5
TR105	BF197	15·8	1	1·6	8·5
TR106	BC187	7·6*	13·4*	12·5	14
TR107	BF194	16·4 (14·4)	0·88 (1·3)	1·38 (1·92)	2·7 (4)
TR108	BF194	9·3	3·6	4·4	5·3

Transistor voltages measured with a 20,000 Ω/V meter on the 10 V and 25 V ranges, with a 10 kΩ resistor connected in series at the point being measured. Set contrast for maximum with no signal applied. Figures in brackets are for 625 where a difference occurs from 405.

Voltage on PC4 (A.G.C. line) 3 V* — Total 22 V line current 87 mA

Voltage at junction R17/C32 13 V — Voltage at junction R18/C7 19 V*

* Voltages marked with an asterisk will vary appreciably with applied signal.

Valves		*Va* 405	*Va* 625	*Vg2* 405	*Vg2* 625	*Vk* 405	*Vk* 625	*Ik (mA)* 405	*Ik (mA)* 625
V1A	PFL200	164	154	167	158	2·8	2·9	23	24
V1B	PFL200	174	156	67	66	—	—	—	—
V2A	PCL86	85	82	—	—	—	—	1·7	1·7
V2B	PCL86	238	234	194	190	4·4	4·2	37	37
V3A	PCL85	45	43	—	—	—	—	—	—
V3B	PCL85	209	207	217	210	17	16·5	51·5	50
V4A	PCF802	190	185	—	—	3·8	3·8	—	—
V4B	PCF802	110	115	70	70	3·8	3·8	—	—
V5	PY800	240	238	—	—	—	—	—	—
V6	PL504	—	—	229	224	—	—	114	142
V7	DY86	—	—	—	—	16·8	17kV	—	—

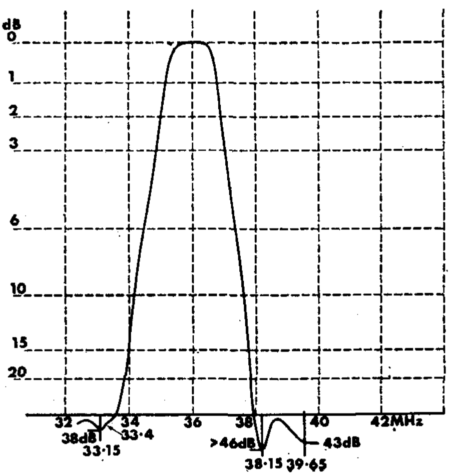
Normal signal applied, controls correctly adjusted for a normal picture, signal then attenuated to only just lock the timebases. All valve voltage, except cathode and E.H.T. voltages, measured on 250 V or 1000 V range. All voltages positive with respect to chassis.

	405	625		405	625
C.R.T. A1	485	492	Boost H.T.	780	815
C.R.T. cathode	140	138	H.T.1	258	250
Focus (4 steps)	0–485	0–485	H.T.2	244	238
E.H.T.	16·8kV	17kV	H.T.3	194	187
			H.T.4	220	217
			H.T.5	190	185

I.F. Panel Alignment (Equipment Required):

1. Sweep frequency generator covering range 32–42 MHz and suitable display unit, i.e. oscilloscope.

2. A.M. signal generator covering the range 30–42 MHz accurate to ±100 kHz, with sine-wave modulation up to a depth of 30 per cent.



F63

(F63) Curve G—Overall Response 405

(F64) Opposite:—

Notes (Curve H—Sound Response 405): 1. Input level 1·6 μV base of TR5 via 50 pF. 2. Output level 1 V p/p junction of L120/R130. 3. Damp TR4 collector with 50n capacitor.

Notes (Curve J—6 MHz Response): 1. Input level 250 μV 6 MHz test point. 2. Output level 1 V p/p collector TR15 4K7. 3. Damp TR6 collector with 50n capacitor.

3. A.M./F.M. signal generator 3–6MHz accurate to ±10kHz capable of 30 per cent sine-wave A.M. modulation and 16·7kHz deviation on F.M. modulation. If A.M. rejection is to be measured accurately, the amount of A.M. on the F.M. signal at 16·7kHz deviation should be less than 1 per cent.

4. Low impedance sound output meter with a maximum indication of 1 W, switchable to show a reduction of 40dB.

5. Valve voltmeter capable of measuring 50–100mV rms at audio frequencies.

6. Capacitor: 50nF damping 1nF and 2pF ceramic. Resistors: 68Ω, 820Ω, 3K9, 10kΩ. All ¼W.

I.F. Panel Alignment (Preparation):

1. Connect the 820Ω resistor across C114 and short circuit PC6 (TR103 base) to chassis. This applies approximately 25dB gain reduction to the I.F. stages.

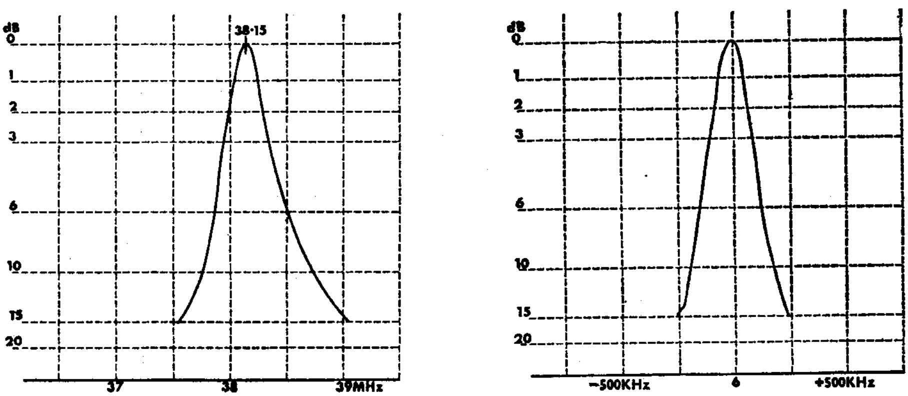
2. Set volume control to maximum.

3. Set the pre-set contrast control (P101) to the centre of its range.

4. A.M. modulation will always be at 30 per cent F.M. modulation will be at 16·7kHz deviation.

5. If preferred the following alignment with the exception of the video rejectors (L119 and L120) can be performed with the set disconnected from the mains, provided that PL1 is removed and a 20V 100mA supply is connected to PL1–6. For sound channel alignment use of a valve voltmeter connected to PL1–2 will replace a sound output meter.

I.F. Panel Alignment (Video Rejectors): Inject a 30 per cent modulated A.M. signal into the base of TR106 via a 1nF capacitor at a 50–100mV level. Measure output on PC10 either with an oscilloscope or a valve voltmeter, capable of measuring 3–6MHz at 0–10V, via a 10kΩ resistor and adjust the rejectors as follows: 625: Adjust L120 for minimum at 6MHz. 405: Adjust L119 for minimum at 3·5MHz.



F64.

(F64) *Left:* Curve H—Sound Response 405. *Right:* Curve J—6MHz Response

I.F. Panel Alignment (Vision I.F.): Proceed as in Table A. Note that at stage 4 of this table, it is convenient to align the 38·15 MHz sound I.F. (stage 1 of Sound Alignment).

Table A

Output Signal: Taken from TR106 collector (SW110) via 10kΩ resistor.
Display Unit: Set to give maximum display at 2 V p-p.
Input: From signal generator, which has its lead terminated with a 68 Ω resistor.

Injection point	*Damping*	*Tune*	*Input*	*Output*	*Notes*
Base of TR105 via 1n0 capacitor	50n from junction L110/C133 to chassis	L113 for min. at 33·4 MHz	A.M. signal generator to give 100 mV output	Valve voltmeter	Switch to 625
		L111 and L112 for curve "A"	Sweep generator 40 mV	Display	
Base of TR104 via 1n0 capacitor	50n TR102 collector to chassis	L110 and L107 for curve "B"	Sweep generator 3 mV		
		L109 and L108 for min. at 38·15 MHz	A.M. signal generator to give 100 mV output	V.V.M.	Switch to 405 (A.M. sound can be aligned)
		Confirm response is close to curve "C"	Sweep generator 3 mV	Display	Switch to 405
Junction C103/L102 (T102)	Disconnect tuner I.F. lead PC2	L104 min. at 41·4 MHz L103 min. at 33·15 MHz	A.M. signal generator to give 100 mV output	V.V.M.	Switch to 625
		L106 for curve "D"	Sweep generator 1·5 mV	Display	
		Check curve "E"			Switch to 405
Tuner alignment point via 10kΩ resistor	Reconnect PC2	L101 for min. at 39·65 MHz	A.M. signal generator to give 100 mV output	V.V.M.	Switch to 405 Band III
Tuner alignment point via 10kΩ resistor	None	L102 and tuner I.F. coil L22 for curve "F"	Sweep generator 100 mV	Display	Switch to 625
		Check for curve "G"			Switch to 405

I.F. Panel Alignment (Sound): Proceed as Table B, which also covers A.M. rejection of the 6 MHz detectors.

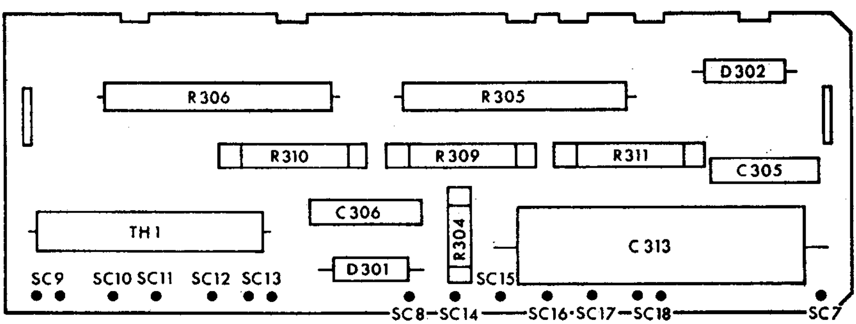
Table B

Output: Measured with a 3 Ω output meter in lieu of speaker or with valve voltmeter across speaker. Nominal output of 100 mW or 0·5 V rms.

Injection point	*Damping*	*Input*	*Adjust*	*Notes*
Base of TR104 via 1n0 capacitor	50n from TR102 collector to chassis	38·15 MHz A.M. 50 μV	L135, L25 and L127 for maximum output	Switch to405
6 MHz test point C187/ C185 (T107) via 3K9 resistor		6 MHz A.M. 1 mV	L123, L126, L128, L130 for maximum output	Switch to 625 Detune L122
		6 MHz A.M. 2 mV	Tune L122 for minimum output occurring between two peaks	Switch to 625
		6 MHz A.M. 20 mV	P102 for minimum output	
		To check ratio detector A.M. rejection		
		6 MHz F.M.	Adjust input lever to give 1.W output	
		6 MHz A.M.	Vary input from 2–30 mV	Output should not exceed 10 mW

I.F. Panel Alignment (Alternative Spot Frequency Method): If a sweep generator is not available, the spot frequency method of Table C, with care, will give abequate alignment.

The completion of this sequence is a mannual sweep of the generator to check that the response follows curves F and G.



F68

(F68) Component Locations—Mains Dropper Panel—Models 2032 and 2033

Table C

Output Signal: Taken from TR106 collector (SW110) via 10kΩ resistor to a valve voltmeter. Output signal not to exceed 0·7V rms.

Input from: A 30 per cent A.M. signal generator, which has its lead terminated with a 68 Ω resistor.

Injection point	*Damping*	*Input*	*Tune*	*Notes*
Base of TR105 via 1n0 capacitor	50n from the junction L110/C133 to chassis	100mV 33·4mHz	L113 for minimum output	Switch to 625
	Add 470Ω across L111	40mV 37·5MHz	L112 for maximum output	
	Remove 470Ω		L111 for maximum output	
Base of TR104 via 1n0 capacitor	50n from TR102 collector to chassis and 470Ω from junction L110/C133 to chassis	3mV 37·5MHz	L110 for maximum output. L107 for maximum output. Repeat L110 for maximum output	
	Remove 470Ω	100mV 38·15MHz	L109 then L108 for minimum output	Switch to 405
Tuner alignment point via 470Ω resistor and 1n0 in series	None	110mV 41·4MHz	L104 for minimum output	Switch to 625
	Remove 820Ω across C114 for this stage	110mV 33·15MHz	L103 for minimum output	
		110mV 39·65MHz	L101 for minimum output	Switch to 405
	None	25mV 37·5MHz	L106 to maximum output	Switch to 625
			L102 for maximum output	
Tuner alignment point via 10kΩ	470Ω from chassis to junction C103/L102	100mV 37·5MHz	L22 (tuner I.F. coil) for maximum output	
	Remove 470Ω resistor	Check by manual sweep for curve "G" on 625 and curve "F" on 405		

Circuit Description (Integrated Tuner): The tuner uses three silicon transistors in a grounded base configuration. A nominal 12V positive supply is derived from the main chassis. On U.H.F. the gang capacitor loads quarter-wave lines to form the tuned circuits for TR1, the R.F. amplifier, and TR2 a self-oscillating mixer.

On V.H.F. the quarter-wave lines are bypassed or used as connectors to conventional coils. The V.H.F. aerial signal is fed via the appropriate band-pass filter to the R.F. amplifier TR1, the output of which feeds the mixer TR2. TR3 (which is inoperative on U.H.F.) functions as the local oscillator on V.H.F.

On all bands, forward A.G.C. is applied to the R.F. amplifier TR1, and the I.F. signal at the collector of TR2 is tuned by L22. L18 and L21 act as oscillator filters.

Circuit Description (I.F. Amplifiers): The I.F. signal from the tuner is bottom coupled into L102, which together with L22 (tuner I.F. output) forms a band-pass coupled circuit. The resultant output is fed to the base of TR102. L103/L104, with their associated tuning capacitors, provide rejection at 33·15MHz and 41·5MHz respectively. L101/C101 reject at approximately 42MHz on 625 and with the addition of C100 rejects at 39·65MHz on 405.

The amplified signal from TR102 appearing across L106 is fed via a capacitive tap to the base of TR104, the collector of which feeds a band-pass circuit formed by L107, C122 and L110.

On 405, L108/C131 extracts the 38·15MHz sound signal to supply the first sound I.F. amplifier (TR107). The bridged-T trap L109, C118, C119 and R121 provides 405 sound rejection at 38·15MHz. When switched to 625, L108/C131 and C178 form a rejector at 31·5MHz and the T trap is switched out.

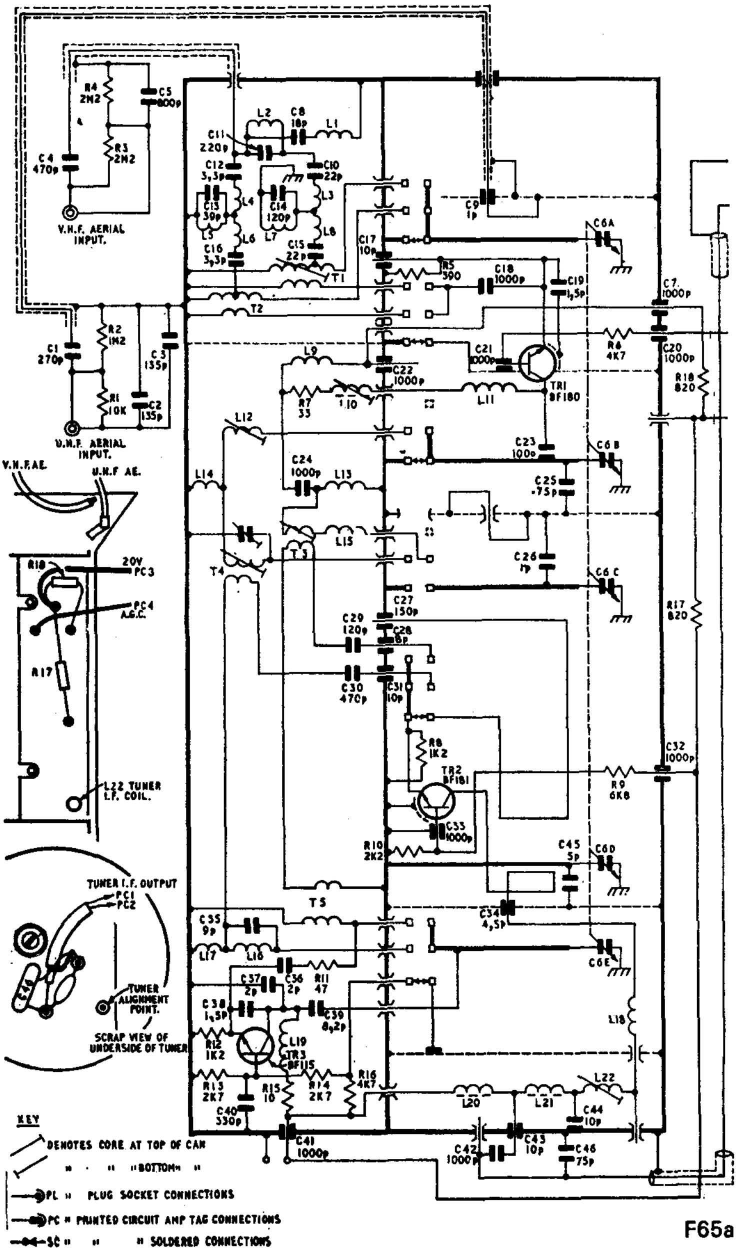
The signal from L110 is fed by a further capacitive tap to TR105. L111 and L112 in the collector circuit form an inductively coupled tuned circuit while L113/C172 rejects 33·4MHz. D101 provides video detection which is filtered by C174, L114 and L115.

Circuit Description (Sound I.F. and Amplifiers): TR107/108 form a dual frequency I.F. amplifier. On 625, T107 detects part of the signal appearing at the collector of TR105 to produce a 6MHz inter-carrier beat which is coupled to L128 and hence TR107. The amplified signal at the collector of TR107 is tuned by L126 and fed to TR108. T110 acts as a ratio detector at 6MHz to produce an A.F. signal across C117 which is filtered by R168 and C192.

On 405, the 38·15MHz signal from L108 is band-pass coupled to L127 and fed into the base of TR107. L125 forms the collector tuned circuit which feeds TR108. The signal appearing at the collector of TR108 is fed to L135/C144 via C145.

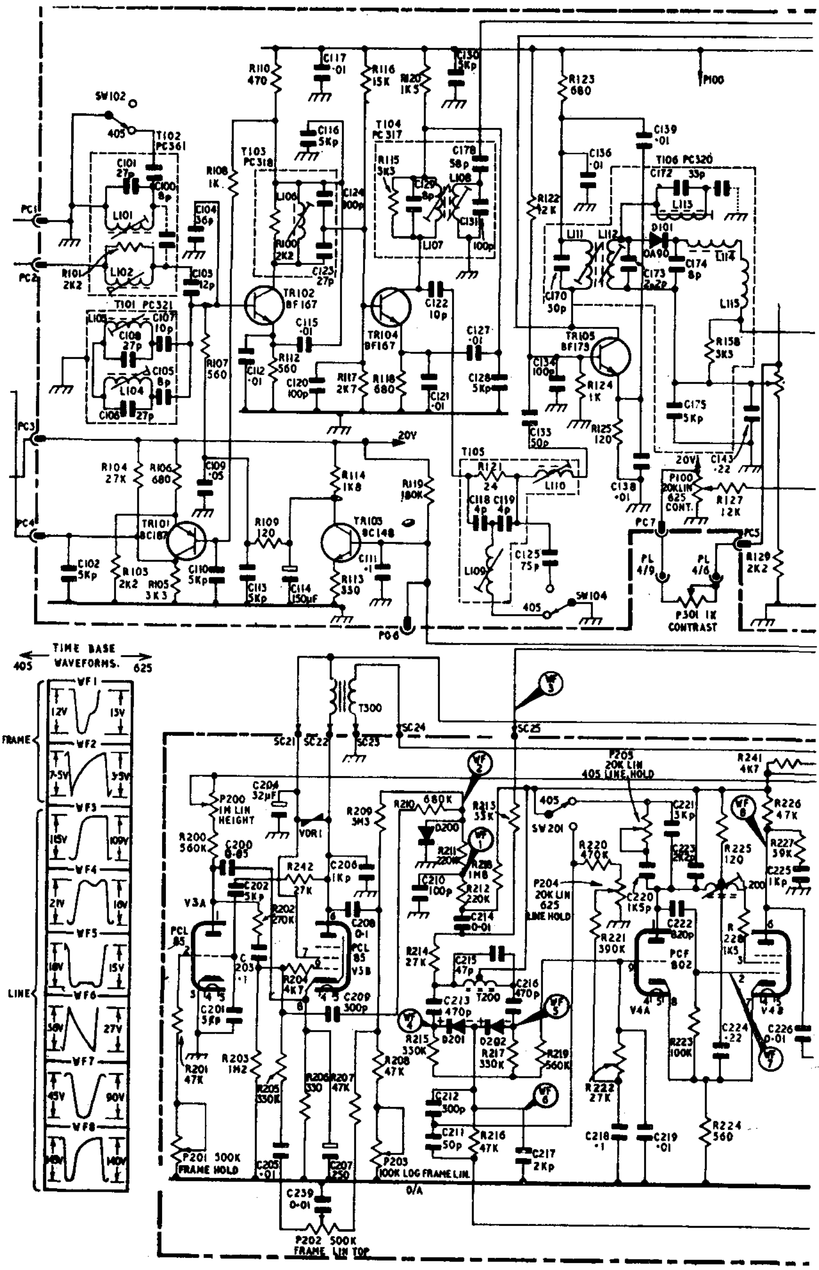
The detected signal from D104 is filtered by C183, L134, C161 and C163. The D.C. component appearing across C163 is fed via R171, R169 and R157 to apply reverse A.G.C. to the base of TR107. Interference pulses are limited by the action of R174, D103, R173, etc. The remaining audio signal is fed via C191 and the volume control to the audio amplifier and output stages (V2A/B). Feedback and tone correction is applied via R181 and C194.

Circuit Diagram Notes: (*See following four pages*) In later production models, R110 is 680Ω, V6 is PL504, TR102 is BF196, TR104 is BF197 and TR105 is BF197.



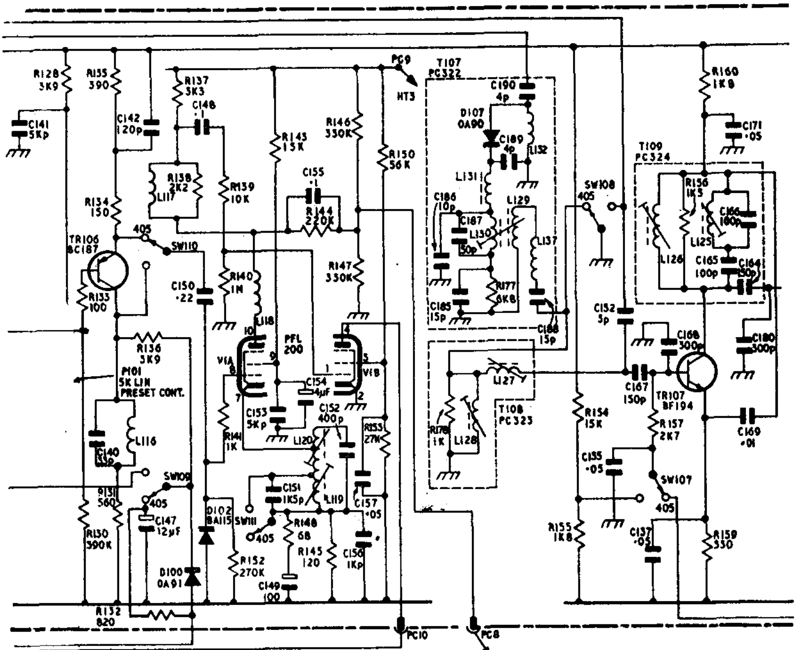
F65a

(F65a) Circuit Diagram—Models 2032 and 2033 (Part)

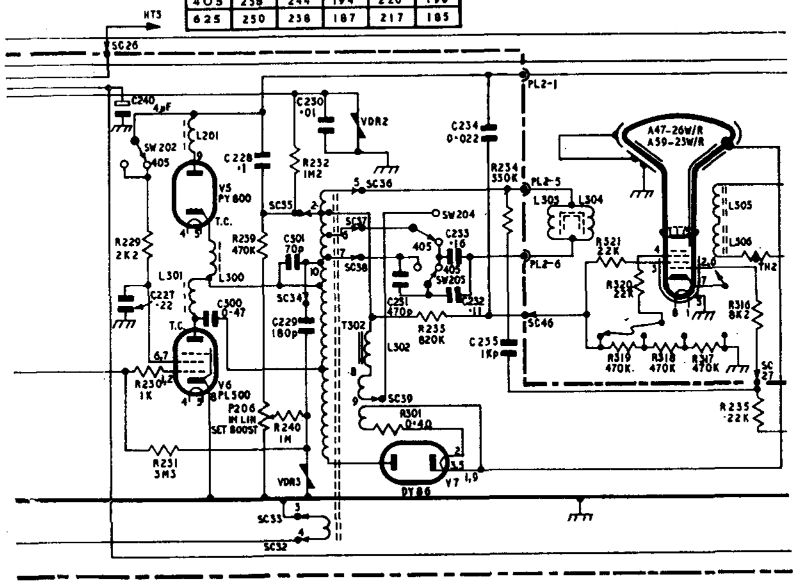


F65b

(F65b) Circuit Diagram (Part)

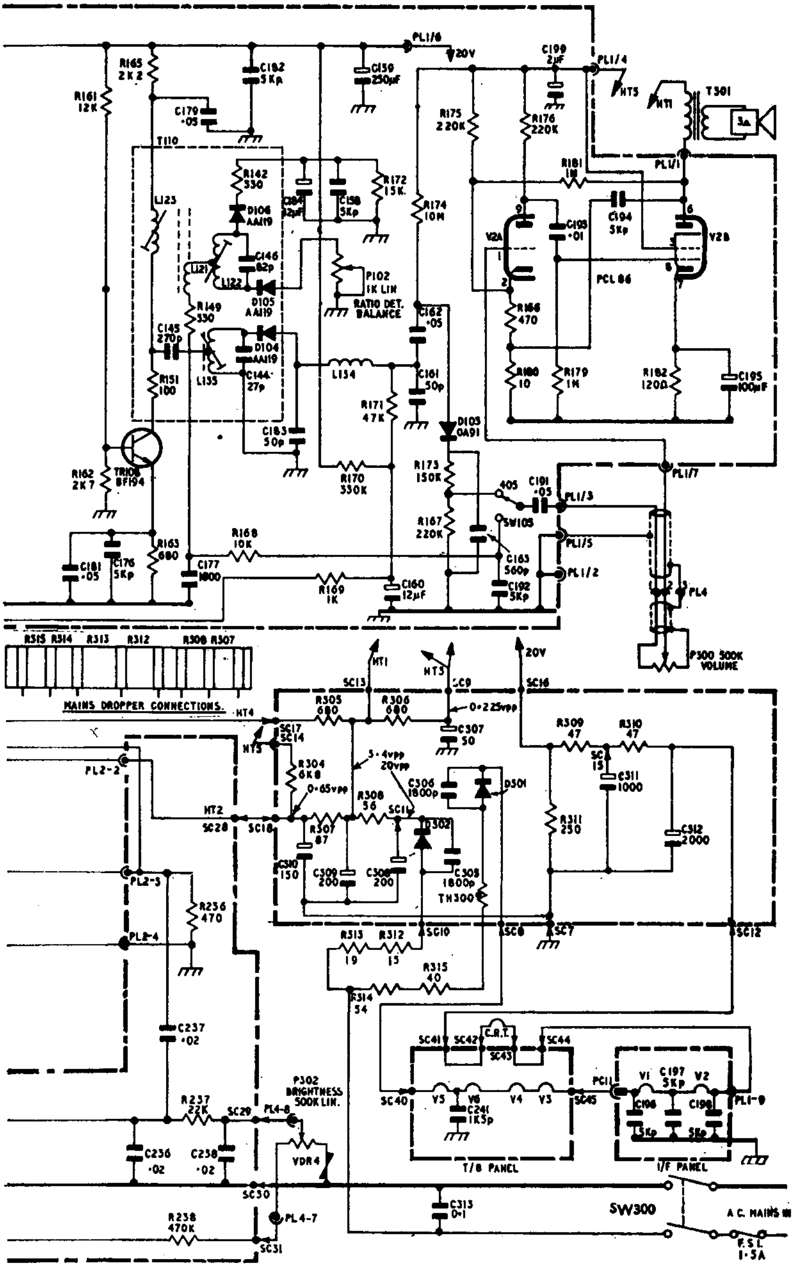


	HT1	HT2	HT3	HT4	HT5
405	258	244	194	220	190
625	250	238	187	217	185



F65c

(F65c) Circuit Diagram (Part)



F65d

(F65d) Circuit Diagram—Models 2032 and 2033 (Continued)

Circuit Description (Video Amplifiers and A.G.C.): On both 405 and 625 systems the video detector output is D.C. coupled to the first video amplifier (TR106), which acts as a video phase splitter. The pre-set contrast (P101) and contrast (P301) controls determine the D.C. voltage on the base of TR106 and hence the collector voltage from which the A.G.C. level is derived.

The video signal is taken from TR106 emitter on 405 and the collector on 625 via C150 to the grid of the video output valve (V1a). D.C. restoration is achieved by D102. L119, L120 in the cathode of V1a together with C151/C152 form switched rejectors at 3·5 MHz (405) and 6 MHz (625).

On 405, the mean D.C. level at TR106 collector is stored via R136/C147 and applied to the base of TR103. On 625 a similar D.C. potential is developed across C111 by allowing D100 to conduct on negative-going synchronizing pulse tips. P100 is switched in on 625 to provide an independent gain setting.

The first A.G.C. amplifier TR103 is maintained in the fully conducting state by R119 until the negative-going A.G.C. potential overcomes the saturated base voltage; in consequence the current in TR103 drops and its collector voltage rises. This rise is fed via filtering components to apply forward A.G.C. to the first vision I.F. transistor (TR102).

When the collector current of TR102 rises to approximately 11 mA the collector voltage will drop below the standing voltage produced by R103, R106 on TR101 emitter. Hence current will flow in R108 and TR101 (second A.G.C. amplifier) causing it to conduct. The collector voltage will consequently rise from the standing value set by R104, R105. This collector voltage is applied to the base of the tuner R.F. amplifier (TR1) to produce a forward A.G.C. action.

Circuit Description (Synchronization and Scanning Circuits): Separation of synchronization pulses is carried out by V1b (PFL200). Line pulses are fed to the phase detector via T200 (synchronization transformer) providing pulses of opposite phase. A reference pulse derived from the line output transformer via SC32 is fed to the junction of the phase detector diodes D102A/B and depending on the relative phase of the synchronization pulse to the reference pulse, a voltage is obtained which controls the grid of V4a (PCF802). V4a and V4b operate as follows:

Sinusoidal oscillation is obtained from the feedback network comprising L200, C222 and their associated components, the oscillatory action occuring between grid 2 and grid 1 of V4b. Frequency control is provided by V4a connected as a capacitive reactance across the tuned circuit L200 etc.

405-line frequency control is provided by P205 in the anode circuit of V4a while on 625-line system P204 provides a D.C. control potential applied to the triode grid. The line drive waveform is determined by the anode network R226, R227 and C225. The line drive is fed via C226 to V6 (PL504) the line output valve. A stabilising circuit is incorporated, which varies the control potential applied to grid 1 of V6 to compensate for variations in the mains supply voltage which would affect the line scan amplitude. The circuit functions as follows:

A positive-going pulse is taken from the line output transformer via C229

and applied to VDR3. Due to the non-linear voltage characteristic of this voltage dependent resistor, a negative potential is obtained, the amplitude being set by P206 and applied via R231 to grid 1 of the line output valve. A drop in mains supply voltage, resulting in a reduction of scanning power, thus reduces the negative potential fed back, increasing the output from the PL504 and maintaining constant picture width. A rise in mains supply voltage achieves the same object by the reverse process.

Field synchronization pulses are integrated by R212 and C210 and clipped by interlace diode D200 then coupled via R210 and C209 to the grid of the pentode V3b (PCL85). The triode and pentode sections of this valve comprise the field generator and field output valve. Control of field linearity is by means of P202 (top linearity) and P203 (overall linearity).

A voltage dependent resistor VDR1 is incorporated in the anode circuit of V3b to limit the peak voltages developed across the field output transformer. The height is stabilised by means of the voltage dependent resistor VDR2 which together with R232 forms a non-linear potentiometer, giving a relatively constant supply to the height control P200.

Circuit Description (Power Supply): The mains supply to the receiver is controlled by SW300 with fuse FS1 on the live side of the switch and the switched neutral linked direct to chassis. It is important, when connecting the receiver to the mains supply, to ensure that the polarity is correct, and the chassis in NOT "live".

Circuit Description (L.T. Power Supply): The diode D301 in series with the heater chain, modifies the waveform of the heater current and introduces a D.C. component. The A.C. component is by-passed to chassis via C312 and the D.C. component is smoothed and filtered by a resistance-capacitance network on the mains dropper bracket assembly. A thermistor TH300 is used to limit switch-on surges.

Circuit Description: *Note:* Due to the heater current waveform, the rms value cannot be measured accurately with a conventional multi-meter. The receiver must not be connected to D.C. mains.

G.E.C. Models 2038 and 2039

General Description: These models are fitted with a five-position V.H.F. tuner unit for the reception of channels 1–13. A position marked "U" is for use in conjunction with the U.H.F. tuner. Two transistors are used in the U.H.F. tuner and thirteen valves (Mullard) are employed in the receiver, together with a 110-degree deflection C.R.T. The receiver incorporates two plated circuit panels—I.F. and Timebase Sections.

Coverage: V.H.F. tuner. Television channels 1–13 on the 405-line system. U.H.F. tuner (where fitted). Television channels 21–68 on the 625-line system.

Intermediate Frequencies: 405: Vision 34·65 Mc/s. Sound 38·15 Mc/s. 625: Vision 39·4 Mc/s. Sound 33·4 Mc/s.

Intercarrier Sound I.F.: 6 Mc/s.

Mains Input: 220–250V A.C. 50 c/s or D.C.

Power Consumption: 170W approximately.

Aerial Input: V.H.F. and U.H.F.: 75 Ω unbalanced.

Loudspeaker: 3 Ω impedance. 19-in. models: 5 in circular. 23in. models: 7 in. elliptical.

Cathode Ray Tube: Models 2038, 19 in., A47-26WR. Models 2039, 23 in., A59-23WR.

Transistors:

TR1	AF186	R.F. U.H.F. tuner
TR2	AF186	Mixer/oscillator

Germanium Diodes:

GR1	OA70	Vision demodulator
GR2	OA79	Sound demodulator (405 only)
GR3	OA81	Noise limiter (405 only)

Selenium Diodes:

MR1/MR2	FSY41A line flywheel detector diodes

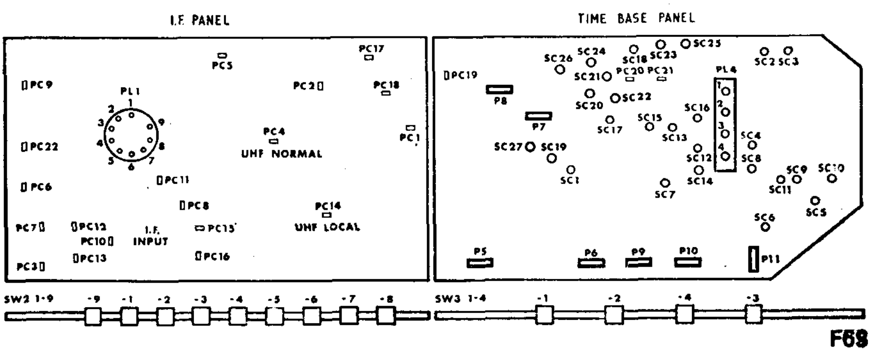
Silicon Junction Diode:

SR1	BY100	Mains rectifier

Valves:

V1	PC900	R.F. amplifier } V.H.F. tuner
V2	PCF801	Mixer/oscillator } V.H.F. tuner (I.F. amplifier on 625-line system)
V3	EF183	Common I.F. amplifier (405) 2nd common I.F. amplifier (625)
V4	EF184	Vision I.F. amplifier (405) 3rd common I.F. amplifier (625)
V5a	PFL200	Video amplifier
V5b		Synchronization separator
V6	EF80	Sound I.F. amplifier (405/625)
V7	EH90	1st audio amplifier (405) Locked oscillator F.M. sound detector (625)
V8	PCL84	Audio output and A.G.C. clamp diode
V9	PCL85	Frame oscillator and output
V10	PCF802	Sinewave oscillator
V11	PY800	Boost diode
V12	PL500	Line output
V13	DY87	E.H.T. rectifier

Adjustments (Mains Supply): Flying leads to the mains dropping resistor enable voltage tapping adjustments to be made. There are three taps at 205,



(F69) Quick Check Plan—Models 2038 and 2039

226 and 245 V, and the leads should be set to the figure nearest to the nominal value of the mains supply voltage. For operation on D.C. supplies, the mains smoothing choke L74 should be shorted out by soldering a short length of suitable wire across the appropriate tags.

Adjustments (Picture Centring): Rotating the two ring magnets situated at the rear of the scanning coil assembly, either together or separately, moves the display horizontally or vertically into the correct position.

Adjustments (Focus): A flylead is provided from the C.R.T. base to the timebase panel which is normally connected to SC18 (HT3). Adjustment may be achieved by adjacent connection to SC12 (A1 of the C.R.T.) and SC16 (chassis).

Adjustments (Vertical Linearity): Linearity at the top of the scan may be adjusted by means of a pre-set potentiometer P7. Over the remainder of the scan, linearity may be adjusted by the pre-set potentiometer P8.

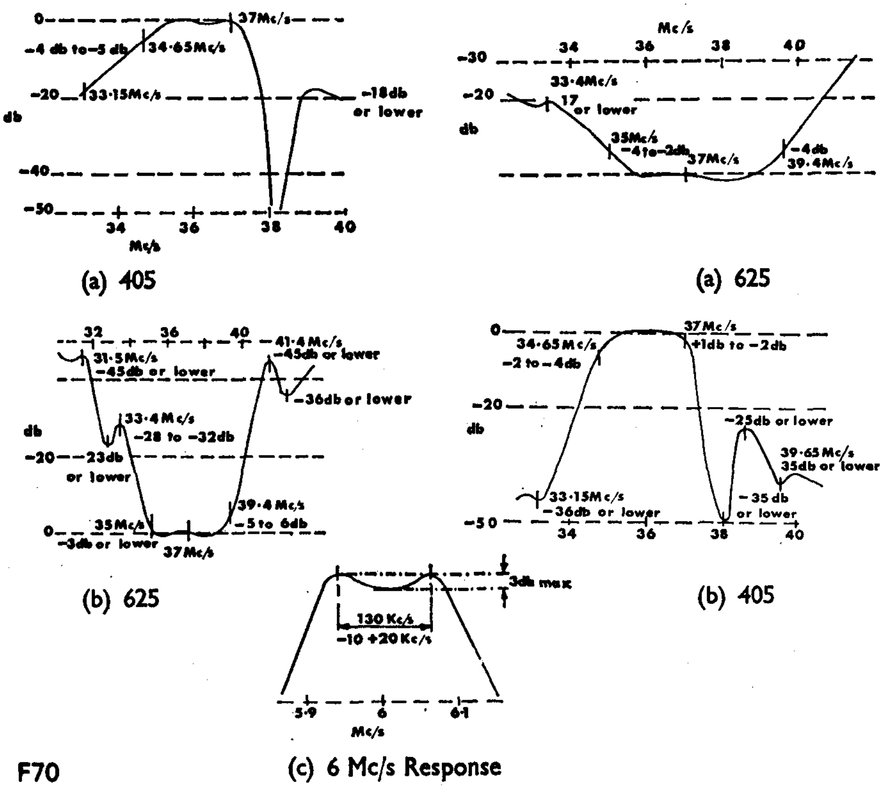
Adjustments (Horizontal Linearity): This is corrected by means of a "shorted-turn" device placed between the scan coils and the neck of the C.R.T. The device is set in a paper sleeve having a bakelite ring cemented at one end for adjustment purposes. Further insertion (towards the bulb of the C.R.T.) contracts the left-hand side of the picture, and withdrawal towards the C.R.T. base socket, expands the left-hand side of the picture. Move the "sleeve" in or out until linearity is better than 5 per cent, but do not over insert, as this will reduce the width and cause overheating of the scan coils. The index on the adjusting ring should always be set in the "three o'clock" position.

Adjustments (Width): The correct width of the picture is determined by setting of the "set boost" control, which is a rotary pre-set control situated on the timebase panel. It is adjusted as follows: With the receiver operating on the 405-line system and with the mains input tapping correctly adjusted, adjust the "set boost" control for minimum voltage between the junction of C176/R132 and chassis (set meter to read 1000 V or higher). Adjust the line linearity sleeve for optimum line linearity as described above, then advance the "set boost" control for a reading of 770 V, and the width should then be correct. Small variations may be made by further adjustment of the "set boost" control, but the boost voltage must be re-checked after each adjustment and must be within the range 750–790 V. Once the width has been set in this manner it is self-compensating for mains supply voltage variations.

Warning: Damage will be caused to the line output stage if the boost voltage is outside the limits specified above.

Adjustments (Other Controls): The vertical hold and 405 and 625 horizontal hold controls are located at the rear of the receiver together with the pre-set height control. Brightness, contrast, volume and on/off switch are on the front of the receiver as are the V.H.F. and U.H.F. tuning controls.

Adjustments (Pre-set Line Hold Control): Normally it will not be necessary to adjust the core of L65, but if the component is changed the method of setting up is as follows: 1. Set the system switch to 625 and the U.H.F. tuner to a blank channel. 2. Set the 625-line hold control P10 to give 2 V



F70

(F70) Alignment Response Curves—Models 2038 and 2039

Note (Alignment Response Curves): The 625 response curves are inverted merely to illustrate negative modulation on 625.

positive between slider and chassis. 3. Adjust the core of L65 so that when a U.H.F. signal is tuned in, the picture locks instantaneously. Check that the same results are obtained with a 405-line transmission. This should occur with P9, the 405-line hold control, approximately in the middle of its travel. Should this not be the case, it may be necessary to slightly readjust L65. In the absence of a 625-line transmission, set the receiver to a 405 position with an appropriate V.H.F. signal applied to the aerial socket. Tune in the signal, adjust L65 for instantaneous locking on this transmission with P9 in the centre of its travel.

Adjustments (Local/Distant Control): A link "A" is provided on the I.F. panel to alter the range of the vision A.G.C. and is primarily for use on 405-line reception. In areas of high signal strength, if cross-modulation or overloading occurs, link "A" should be set to PC6 (local). Otherwise it should be set to PC3 (distant). Further adjustment for high signal strength on 625-line U.H.F. reception is provided by removing link from PC4 and connecting it to PC14.

Note: The V.H.F. local/distant link "A" will also affect U.H.F. reception and can be used to overcome high signal strength problems on the 625-line system, providing the adjustment is also suitable for the prevailing reception conditions on the 405-line system.

Adjustments (Band I and Band III Channel Tuning): The band switching, from Band I to Band III and vice versa, is carried out automatically as the tuner is rotated, by a system of shaped plates actuating the switch. In some areas, where B.B.C.1 can be received on a Band III frequency, it may be necessary to reverse the shaped plate, on a B.B.C. position, to change over from Band I to Band III; and to retune the V.H.F. fine tuner to cover the frequency in use. (Each position is tunable over the whole of Band I and Band III providing that the switch is actuated.) The screw holding the shaped plate or segment is merely loosened, the plate lifted out and reversed, and the screw tightened, so that the switch action is reversed.

Adjustments (625-line Reception on V.H.F.): Where there is a system enabling 625-line transmission to be received on a V.H.F. channel, the receiver may be adapted to suit. The cam at the rear of the tuner unit must be altered to effect 405/625 switching at the correct channel, and the flying lead, connected to PC8 on the I.F. board, must be altered and fitted to PC13 to enable the V.H.F. tuner to function on 625 lines.

Access for Service: Servicing can normally be carried out with the chassis in the cabinet since the majority of components are readily accessible once the cabinet back is removed. In addition, by loosening the 2 × 4BA head PK fixing screws, the chassis can be removed from the cabinet, after releasing the system switch operating linkage, to the extent of the connecting leads. The leads and connections can, of course, be disconnected if further dismantling is required.

To disengage the system switch on early production models, release the cable securing clip, NOT the nipple screw. The nipple can then be lifted out of its forked holder. This method of disengagement avoids resetting the system switch on re-assembly. Later models use a solid rod to operate the system switch and this should be disengaged at its lower end. Pull off the retaining sleeve and remove the plastic bush from the switch operating quadrant.

Removal of V.H.F. and U.H.F. Tuners: To remove the panel carrying the tuners from the cabinet first pull off the knobs from the front (with the exception of the two transparent fine tuner knobs which have flanges on the inside of the escutcheon). Remove the fixing at the side steady bracket, and undo the four 4BA cheese-headed screws (with washers) securing the panel to the inside of the escutcheon. Further dismantling can then be carried out if necessary.

Removal of Scanning Coil Assembly: Remove the C.R.T. base connector panel and the connector plug from the timebase panel. Slacken the clip securing the assembly to the tube neck, and withdraw carefully, taking special care not to damage the linearity sleeve.

Removal of Line Scan Transformer: Unclip the leads from the side of the screening cover, and slide out the grommet carrying the E.H.T. cable. Loosen the two fixing screws and remove the screening cover. Take off the

TABLE A

Signal injected into	*Step*	*Switch*	*Damping*	*Adjust*	*Frequency (Mc/s)*	*Approx. final input sensitivity*	*Output*	*Meter deflection*
Common I.F.	1	405	—	T5 pri	38·15	—	50 mW	Max. sound
Amplifier grid	2	405	—	T5 sec	38·15	—	50 mW	Max. sound
Signal generator	3	405	—	T2 sec	38·15	100 μV	50 mW	Max. sound
Terminated in 68 ohms	4	405	—	L 38	38·15	100 mV	0·5 V	Max. vision
I.F. O/p lead from	5	405	33 T3 pri	T3 sec	37	16 mV	5 V	Max. vision
Tuner disconnected	6	405	330 T2 pri	T3 pri	37	31 mV	5 V	Max. vision
From I.F. panel and 1000p capacitor across I.F. input points	7	625	330 T2 pri	L39	36·9	12 mV	5 V	Max. vision
50 per cent modulation	8	625	330 L39	T2 pri	37·3	6 mV	5 V	Max. vision (a)
		Remove 1000p across I.F. input points						
Input socket of	9	625	330 L39	L35	33·4	50 mV	5 V	Min. vision
I.F. chassis via 1000pf	10	625	330 L39	L36	41·4	100 mV	5 V	Min. vision
Connected in series with inner	11	625	330 L39	L37	33·15	10 mV	5 V	Min. vision
Lead (live)	12	405	330 L39	L34	39·65	10 mV	5 V	Min. vision
Outer to chassis	13	405	330 L39	T1 sec	33·15	10 mV	5 V	Min. vision
	14	405	330 L39	T1 pri	35·25	2 mV	5 V	Max. vision
See footnotes	15	625	330 Tpri	L9	37·8	25 mV	2·5 V	Max. vision (b)

Notes:

For Step 15, injection is to the 100 ohms resistor test point on top of the V.H.F. tuner. A 1000pF capacitor should be connected across the U.H.F.I.F. output lead at its connection to the V.H.F. tuner. Reconnect I.F. lead, and set bias to −4V.

Checks should be made at (a) and (b) of the curve shapes obtained on 405 and 625. The response curves show the parameters that should be obtained and the curves should be reasonably smooth. The curves and parameters may be checked by slowly tuning the signal generator over the appropriate range and watching the response on an output meter. Dips or peaks should not exceed 2dB.

E.H.T. and top cap connectors, and remove the PL500, and PY800 if thought necessary. Unsolder the leads to the transformer, taking note of the colour coded connections. Remove top fixing screw (a 4BA head PK) and lift up transformer from bottom key-slot fixing.

Removal of C.R.T.: All models: The lugs on the rim guard of the C.R.T. are secured to the cabinet by four 2BA bolts and nuts, and there are knurled nuts to allow for slight discrepancies in tolerances. When fitting a new "P" tube make sure that front of C.R.T. is a snug fit to escutcheon.

Note: If it is necessary to replace the C.R.T., it must be replaced by one of the same type and not a type which requires protection from implosion.

Alignment (Equipment Required): A.M. signal generator, 30–40 Mc/s, accurate to $\pm$100 kc/s, modulation variable between 30 and 50 per cent.

A.M./F.M. signal generator, 3–6 Mc/s, accurate to $\pm$10 kc/s, 30 per cent modulation A.M. and 50 kc/s deviation F.M.

Valve voltmeter covering ranges 0–10 V A.C. and 0–300 mV A.C.

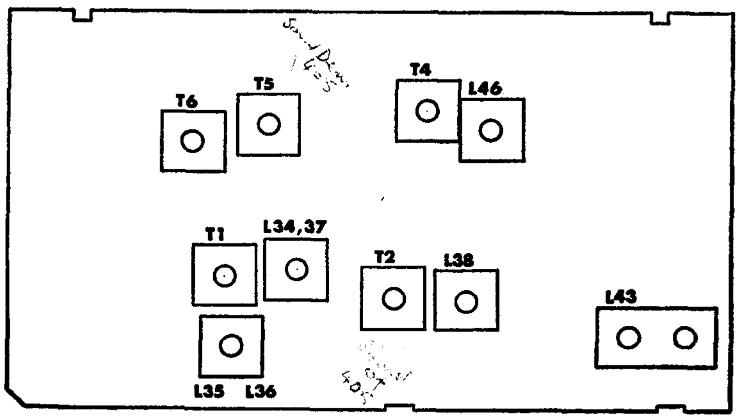
Low impedance (3 Ω approximately) sound output meter, maximum indication 1 W, switchable to show a reduction of 40 dB.

Resistors: 330 Ω; 6·8 kΩ. Capacitors: 1000 pF; 0·1 μF 350 V wkg.

A variable bias supply of approximately 4–5 V. Connect to PL1–4 (negative) and chassis (positive), and set to zero, except for step 15, Table A.

Alignment (Vision and 405 Sound): Connect signal generator as in Table A, the valve voltmeter (set to 0–10 V A.C. and via a 6·8 kΩ) between pin 10 of V5a and chassis, and the sound output meter across the secondary of T7 (disconnect loudspeaker). Proceed as in Table A (opposite).

TOP OF FORMER	SEC	SEC	SEC	PRI	SEC	L35	L34	L39	(b) 3·5 Mc/s		L47
BOTTOM OF FORMER	PRI	PRI	PRI	SEC	PRI	L36	L37	L38	(a) 6 Mc/s	SEC	
	T1	T2	T3	T4	T5	L35,36	L34,37	L38,39	L46	T6	L47



F56

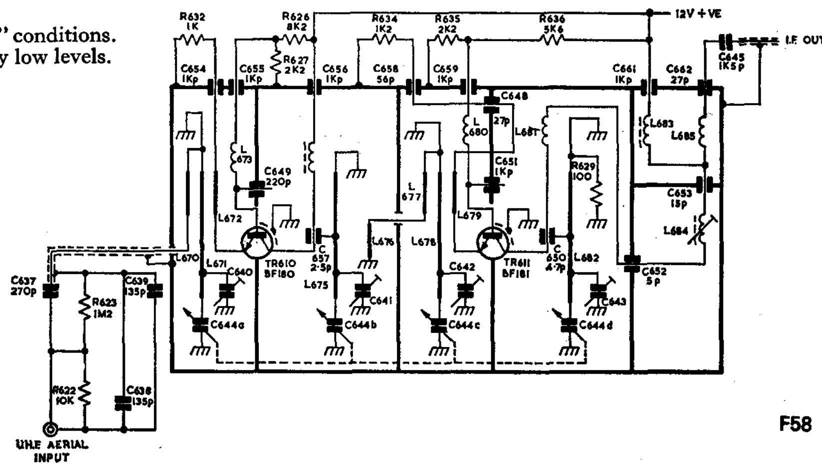
(F56) Alignment Diagram—Models 2038 and 2039

TABLE B

Inject	Damping	Switch	Adjust	Frequency	Final sensitivity level	Output	Meter deflection
Pin 8, V5a	330 T4 pri	625	T4 sec	6 Mc/s CW	60 mV	220 mV	Max.
Pin 8, V5a	330 T4 sec	625	T4 pri	6 Mc/s CW	60 mV	220 mV	Max.
Pin 8, V5a	—	625	T6	6 Mc/s CW	5 mV	220 mV	Max.*
			Check response				
Discriminator alignment							
Pin 8, V5a	—	625	T6	6·1 Mc/s	5 mV	220 mV	Max.
Remove 0·1 μF capacitor and valve voltmeter. Set output meter to 1 W. Set the generator to 6 Mc/s A.M., 30 per cent modulation, with the volume control at maximum							
Pin 8, V5a	—	625	L47	6 Mc/s	30 mV	—	Min. A.M.
Pin 8, V5a	—	625	T6	6 Mc/s	1 mV	—	Min. A.M.–

Notes:

* T6 core must be at base of former.
– Minimum A.M. is a dip between two "out of lock" conditions.
This adjustment centralises the discriminator at very low levels.



(F58) Circuit Diagram of a Silicon U.H.F. Tuner Used in Some Later Models

F58

Alignment (405 and 625 Video Stage Rejectors): Connections for rejector alignment: Signal generator—to pin 8 of V5a. Valve voltmeter (set to 10 V A.C.)—to video anode via a 6·8 kΩ resistor.

1. Set the system switch to 625. 2. Set the generator to 6 Mc/s CW at maximum output. 3. Tune L46 (bottom) for maximum rejection at 6 Mc/s. 4. Set the system switch to 405. 5. Set the generator to 3·5 Mc/s CW at maximum output. 6. Tune L46 (top) for maximum rejection at 3·5 Mc/s.

Alignment (A.M. Rejection Check): Switch signal generator to F.M. (16·8 kc/s deviation). Adjust generator output to give an indication of 300 mW. Switch generator to A.M. 30 per cent modulation and check that the output meter reading has dropped at least 30 dB (i.e. a reading of approximately 0·3 mW should be indicated on the output meter). The A.M. rejection figure of 30 dB should hold good between input levels of 5 and 70 mV.

Alignment (625 Sound): Connections for sound alignment: Signal generator—to pin 8 of V5a. Valve voltmeter (set to 300 V A.C.)—to pin 2 of V7 via a 6·8 kΩ resistor. Output meter across T7 secondary with loudspeaker disconnected (100 mW). Connect a 0·1 μF 350 V capacitor between pin 7 of V7 and chassis. Proceed as in Table B (opposite).

VOLTAGE AND CURRENT MEASUREMENTS

Valve		*Va*		*Vg1*		*Vg2*		*Vk*		*Ik (mA)*	
		405	*625*	*405*	*625*	*405*	*625*	*405*	*625*	*405*	*625*
V1	PC900	140*	—	—0·6	—	—	—	—	—	9	—
V2A }	PCF801	152*	138*	—	—	110*	77*	—	—	8·7	11·5
V2B }		56*	—	—	—	—	—	—	—	7·4	—
V3	EF183	182*	172*	—	—	75*	50*	1·6	1·85	14·7	17
V4	EF184	180*	172*	—	—	180*	172*	2·1	2.0	14	13·3
V5A }	PFL200	141*	120*	—	—	178*	167*	3·5	5·5	20·0	28
V5B* }											
V6	EF80	178*	172*	—	—	178*	172*	2·1	2·0	14	13·3
V7	EH90	81	125	—	—	46	41	1·7	1·6	1·7	1·6
V8A	PCL84	220	218	—	—	230	228	4·1	3·0	25·8	25
V5B	PFL200	165*	155*	—	—	90*	90*	—	—	—	—
V9A }	PCL85	49	52	—	—	—	—	—	—	—	—
V9B }		195	190	—	—	212	205	17	16·5	51·5	50
V10A }	PCF802	194	185	—	—	—	—	3·4	3·4	—	—
V10B }		122	115	—	—	187	180	3·4	3·4	—	—
V11	PY800	232	225	—	—	—	—	—	—	—	—
V12	PL500	—	—	—	—	212	203	—	—	114	142
V13	DY86	—	—	—	—	—	—	16·8	17kV	—	—

* Reading obtained via 100k ohms resistor in series with meter clip.

Test Conditions: V1–V8 measurements are taken under the following conditions: No signal. Contrast control at maximum unless otherwise specified. Supply volts 245 V A.C. 50 c/s. Ballast resistor set to 245 V tap.

Measurements on 625 with V.H.F. tuner in "U.H.F." position. Anode

and grid 2 voltages measured on 250 V range of 20,000 ohms per volt instrument unless otherwise specified. Cathode and other low potentials measured on the 10 V range of the same instrument. All potentials quoted are in relation to chassis. All readings marked * were obtained via a 100 kΩ resistor in series with the meter prodclip.

Conditions for the measurement of potentials other than V1–V8 were as above with the following exceptions: Normal signal applied, controls correctly adjusted for a normal picture. Signal then attenuated to only just lock the timebases. All voltage measurements taken on 250 V or 1000 V range (except E.H.T.).

	405	625		405	625
C.R.T. A1	490	510			
C.R.T. cathode	112	114	H.T.1	250	245
C.R.T. focus electrode (4 steps)	0	510	H.T.2	238	232
E.H.T.	16·8	17kV	H.T.3	200	195
Total H.T. current through smoothing choke (74) mA	325	340	H.T.4	220	214
			H.T.5	150	—
Total heater current (mA)	300	300	H.T. to height control	180	190
Total U.H.F. tuner current	—	8			
Boost H.T.	760	780			

Circuit Description (R.F. and Frequency Changing Stages—V.H.F.): The V.H.F. aerial is coupled via the aerial isolating capacitors, I.F. rejector L5 and M.W. rejector L4 to the grid of the neutrode amplifier V1 (PC900). The output from V1 is applied via the switched band-pass coils (L7/8 etc.) to the grid of the pentode section of V2 (PCF801). This is a frequency changer valve, the triode section acting as a local oscillator and the pentode section as a mixer. The I.F. signals appearing at the anode of the pentode section of V2 are coupled via L9 (frequency changer anode coil) and T1 (on the I.F. panel) to the grid of V3, the common I.F. amplifier.

Circuit Description (R.F. and Frequency Changing Stages—U.H.F.): The U.H.F. aerial is coupled via the aerial isolating capacitors to a quarter-wave transistorised U.H.F. tuner. The unit uses two AF186 transistors, operating as R.F. amplifier and frequency changer. The I.F. output from the frequency changer is coupled via L15 to a balanced circuit L12, L8, L10 and thence to the grid of V2A which acts as an additional I.F. amplifier on 625. The valves V1 and V2b are rendered inoperative on 625 by SW2–9.

Circuit Description (Common I.F. Amplifier—405): Sound and vision signals are passed via T1 to the grid of V3 (EF183). T1 incorporates an adjacent channel sound rejector tuned to 33·15 Mc/s. V3 amplifies both sound and vision signal. The vision signal is coupled by C79 to the grid of the vision I.F. amplifier V4 (EF184). Components L38, C81, C83 and R54 form a "bridged T" type sound rejector. Sound take-off is provided by inductive coupling to the primary of T2 and injected into the grid of the sound I.F. amplifier, V6 (EF80) via C111.

Circuit Description (Vision Channel—405): The output of V4 is coupled via T3 to the vision demodulator GR1 (OA70). The demodulated vision signal is fed through the R.F. filter coil L41 and the I.F. filter coil L43 to V5a (PLF200) the video amplifier. The video signals are coupled to the C.R.T. cathode via the anti-flutter network C102, R72. The tuned circuit L46, C99, C95 rejects the 3·5 Mc/s beat frequency produced by the sound and vision carriers.

Circuit Description (Sound Channel—405): Sound I.F. signals are amplified by V6 (EF80) and applied via T5 to the sound demodulator GR2 (OA79). Components R84, GR3 (OA81), R85 and C119 form a noise limiter circuit, the A.F. signal being routed via C117 and C120 to the grid of V7 (EH90) which is employed as an audio amplifier. V8a (PCL84) is the sound output stage. Sound A.G.C. is applied to the grid of V6 via R80 and R81.

Circuit Description (I.F. and Video Amplifier—625): Sound and vision signals are passed via T1 to the grid of V3 (EF183). L35 and L36 form adjacent channel traps to provide the additional selectivity necessary with the increased bandwidth employed on the 625-line system. SW2-2 removes the 405 adjacent channel rejectors from the circuit when switched to 625. The signal at the anode of V3 is capacitively coupled via C79, R56, C84 and L39 to the grid of V4 (EF184). SW2-4 removes from the circuit the 38·15 Mc/s 405 sound rejector L38 and brings C84 and R56 into circuit.

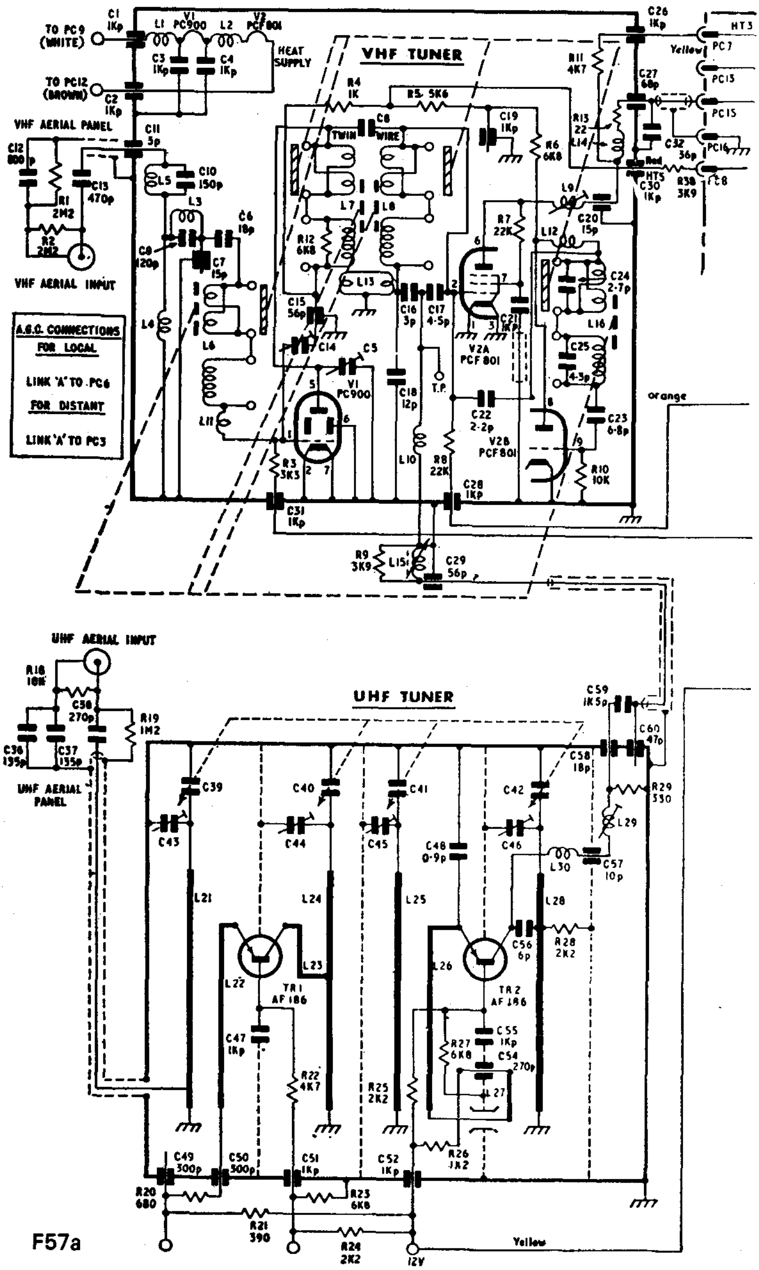
The signal at the anode of V4 is coupled via T3 to the vision demodulator GR1 (OA70). The demodulated vision signal is fed through the R.F. filter coil L40 and I.F. filter coil L42 and A.C. coupled via C91 to the grid of V5a (PFL200) the video amplifier.

SW2-6 and 7 form a double-pole changeover switch reversing the polarity of the vision demodulator in accordance with the polarity of the signals on the two systems. Additionally SW-6 applies a proportion of the cathode bias potential to the grid of the video amplifier via the potentiometer network R26, R66 thus permitting correction to the working point of the video amplifier for A.C. coupled operation.

SW2-8 modifies the synchronizing coupling by adding C98, R71 and C97 in series with R73. Capacitor C97 effectively lowers the value of the synchronizing coupling capacitor C104 whilst the inclusion of R71 and C98 lessens the possibility of H.F. interference pulses affecting the operation of V5b (PFL200).

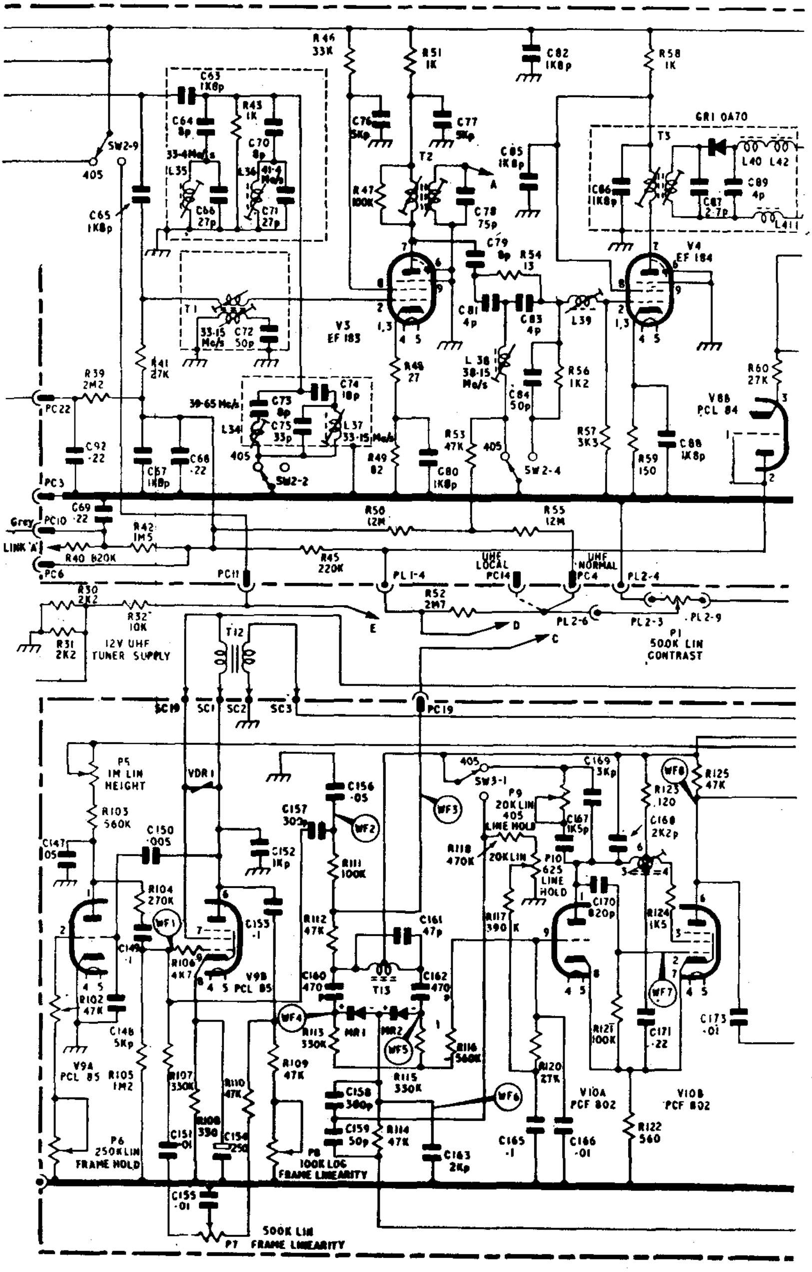
The video signals are coupled to the C.R.T. via the anti-flutter network R72, C102. SW2-5 in the cathode of the video amplifier retunes L46 to 6 Mc/s and at the same time alters the cathode compensation of the video amplifier for 625-line operation.

Circuit Description (Sound Channel—625): The F.M. modulated 6 Mc/s beat signal present at the cathode of V5a is coupled via C103 and the band-pass transformer T4 to the grid of V6. SW2-3 removes from the grid of V6 signals which might appear at a frequency of 38·15 Mc/s and also retunes the secondary of T2 to 33·4 Mc/s to provide sound rejection. When in the 405 position SW2-3 short circuits C130, C131 and C132 thus preventing the oscillator section of the EH90 from operating. The F.M./I.F. signal appearing at the anode of V6 is coupled via the driver transformer T6 to the grid of the locked



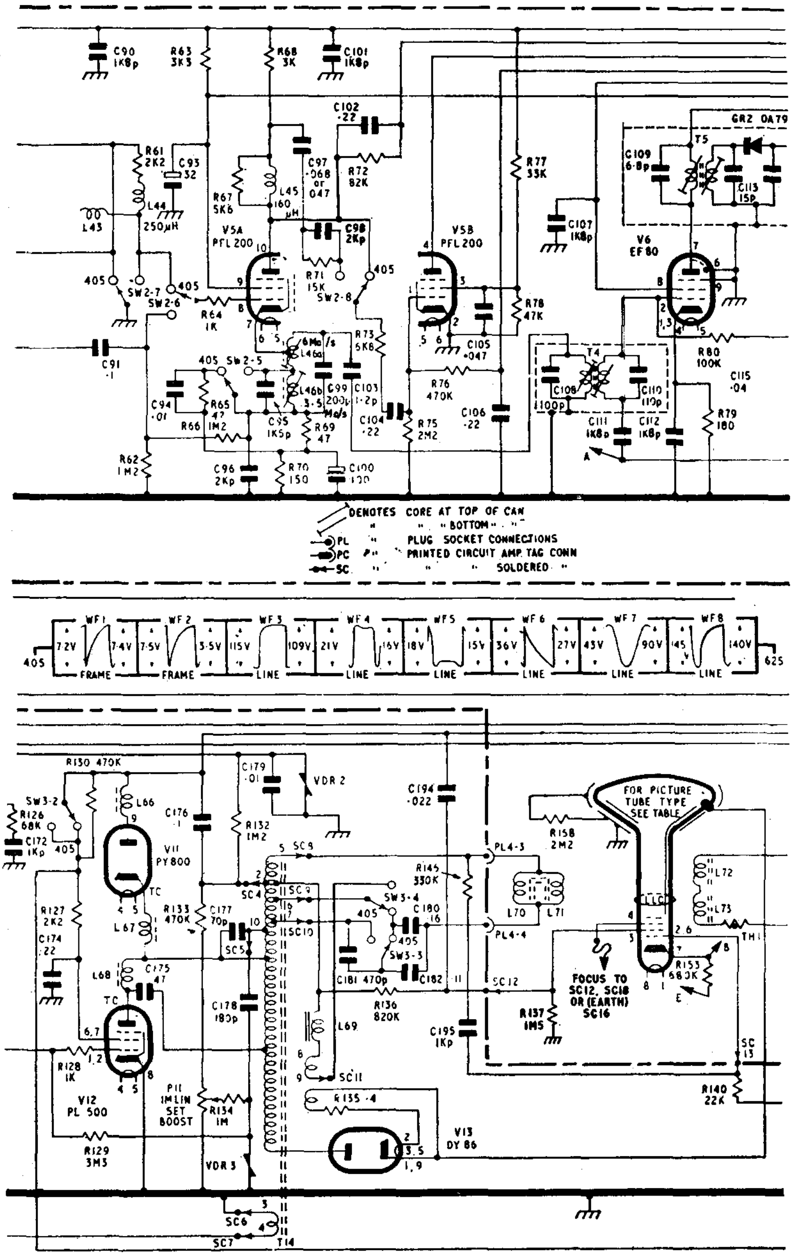
F57a

(F57a) CIRCUIT DIAGRAM—MODELS 2038 AND 2039 (PART)



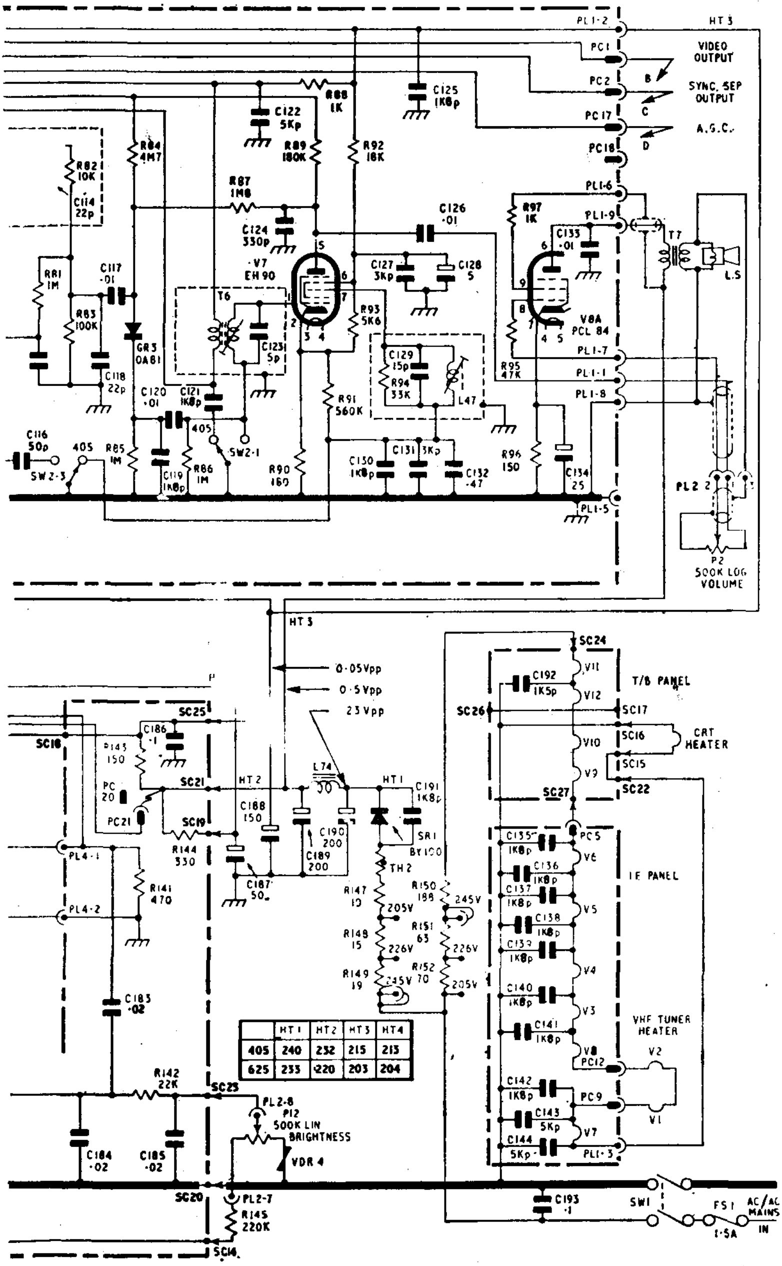
F57b

(F57b) Circuit Diagram—Models 2038 and 2039 (Part)



F57c

(F57c) Circuit Diagram—Models 2038 and 2039 (Part)



	HT1	HT2	HT3	HT4
405	240	232	215	213
625	233	220	203	204

F57d

(F57d) Circuit Diagram—Models 2038 and 2039 (Continued)

oscillator discriminator V7 (EH90). SW2-1 removes from the grid of V7 any audio signal which might appear and switches the anode circuit of V6 to 6 Mc/s operation.

The suppressor grid of V7 is returned to the cathode via a parallel tuned circuit L47, C129, R94. This provides a quadrature voltage which, combined with the action of the signal voltage at the grid of the EH90, produces an audio voltage at the anode corresponding to the deviation in frequency of the signal voltage. The audio signal is coupled via C126 to the grid of the output stage V8a (PCL84) and de-emphasis is provided by C124.

Circuit Description (Synchronization and Scanning Circuits): Separation of synchronization pulses is carried out by V5b (PFL200). Line pulses are fed to the phase detector via T13 (sync. transformer) providing pulses of opposite phase. A reference pulse derived from the line output transformer via SC7 is fed to the junction of the phase detector diodes MR1/2 and depending on the relative phase of the synchronization pulse to the reference pulse, a voltage is obtained which controls the grid of V10a (PCF802).

Circuit Description (Operation of V10a and V10b): Sinusoidal oscillation is obtained from the feedback network comprising L65, C170 and their associated components, the oscillatory action occurring between grid 2 and grid 1 of V10b. Frequency control is provided by V10a connected as a capacitive reactance across the tuned circuit L65 etc.

405-line frequency control is provided by P9 in the anode circuit of V10a; whilst on the 625-line system P10 provides a D.C. control potential applied to the triode grid. The line drive waveform is determined by the anode network R125, R126 and C172.

The line drive is fed via C173 to V12 (PL500) the line output valve. A stabilising circuit is incorporated, which varies the control potential applied to grid 1 of V12, to compensate for variations in the mains supply voltage which would affect the line scan amplitude. The circuit functions as follows:

A positive going pulse is taken from the line output transformer via C178 and applied to VDR3. Due to the non-linear voltage characteristic of this voltage dependent resistor, a negative potential is obtained, the amplitude being set by P11, and applied via R129 to grid 1 of the line output valve. A drop in mains supply voltage, resulting in a reduction of scanning power, thus reduces the negative potential fed back, increasing the output from the PL500 and maintaining constant picture width. A rise in mains supply voltage achieves the same object by the reverse process.

Frame synchronization pulses are integrated by R111 and C156 and passed via C157 and R106 to the grid of the pentode V9b (PCL85). The triode and pentode sections of this valve comprise the frame generator and frame output valve. Control of frame linearity is by means of P7 (top linearity) and P8 (overall linearity). A voltage dependent resistor VDR1 is incorporated in the anode circuit of V9b to limit the peak voltages developed across the frame output transformer. The height is stabilised by means of the voltage dependent resistor VDR2 which together with R132 forms a non-linear potentiometer, giving a relatively constant voltage supply to the height control P5.

Circuit Description (Power Supply): The mains supply to the receiver is controlled by SW1 with fuse FS1 on the live side of the switch and the switched neutral linked direct to chassis. It is important, when connecting the receiver to the mains supply to ensure that the polarity is correct, and the chassis is NOT "live".

The mains smoothing choke L74 should be shorted out for D.C. operation. HT2 supplies the line output valve V12 and V8a, the A.F. pentode. A link PC20–PC21, situated on the scanning panel if disconnected removes H.T. from the line timebase during alignment. HT3 supplies the brightness circuit, the I.F. and R.F. circuits, the video output valve, the synchronizing separator and the line oscillator. HT4 supplies the frame output stage.

The heater current is 300mA. SR1 (BY100) is a silicon junction diode used as a half-wave mains rectifier. Heavy switching currents are reduced by the inclusion of the thermistor TH2 in the input side of the H.T. rectifier.

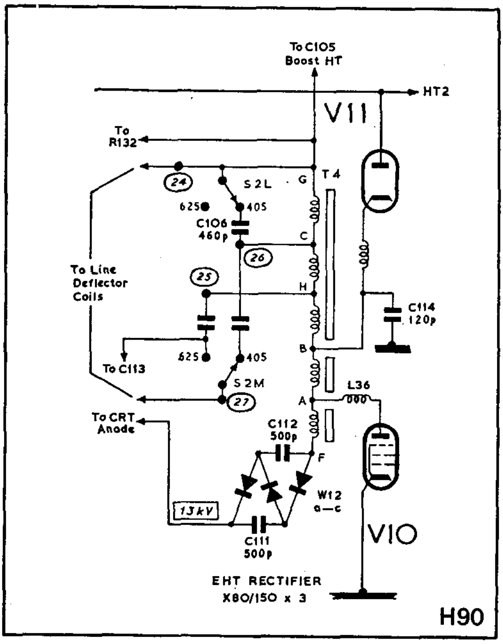
A 12V supply for the U.H.F. tuner transistors is obtained from a bleed from HT3 switched into circuit by SW2-9.

Circuit Description (Vision A.G.C.): The synchronizing separator grid current flowing in R76 provides a negative potential roughly proportional to the mean level of the video signal. This potential smoothed by C106 is applied as A.G.C. bias via conventional filter and decoupling networks, to the grids of the R.F. and mixer stages and the common I.F. stage V3. An opposing positive potential to back off or delay the negative A.G.C. potential is derived via R52 from the contrast control P1. The triode V8b is connected as a diode clamp across the A.G.C. line to prevent it going positive in the absence of a signal, and (on 625) is returned to the vision demodulator load resistor to supplement the A.G.C. voltage and prevent "blocking" by strong signals. Adjustments to A.G.C. are described elsewhere.

H.M.V. Model 2645

General Description: 16-in. television receiver with tuners and chassis adapted from B.R.C.1400 Series, which is described in the 1968–69 volume.

Circuit Note: 1400 Series chassis fitted to 16-in. portable receivers differs from the circuit diagram published in the 1400 Series manual in that the voltage-trebler providing 20kV E.H.T. is replaced with a voltage-doubler circuit providing 13kV E.H.T. See diagram (H90) below.



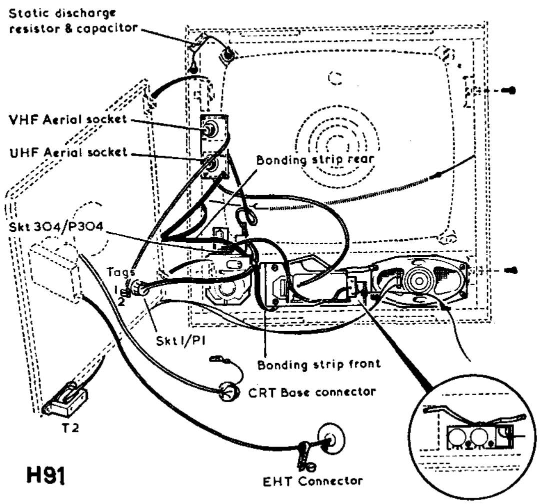
(H90) E.H.T. CIRCUIT—MODEL 2645

Component Differences: Component details are given in 1400 Series information, but, the following component differences should be noted: C106 (460pF), C114 (120pF), R145 (100Ω), L36 (V10 anode choke), T4 (line output transformer), V10 (angled valve holder), W12a–W12c (E.H.T. selenium rectifiers) and printed board assembly.

Note: L36 is not fitted when Mazda PL500 Series E is used.

Access for Service: Remove cabinet back (four screws). Release chassis from right-hand mounting brackets (two screws), then take out screw from cleat securing E.H.T. lead to cabinet moulded front. The printed board can be hinged open or lifted off its hinges for complete accessibility as described in 1400 Series information. The illustration (H91) shows the C.R.T. base and anode connectors disconnected and the chassis unhinged to enable all interconnections to be seen.

Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released



(H91) INTERCONNECTIONS DIAGRAM—MODEL 2645

from cabinet as described in 1400 Series information, but, in addition free the following: 1. Bonding strip (rear) from V.H.F. tuner (one screw). 2. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. V.H.F. aerial socket (three screws) and unsolder socket earth connection. 4. SKT304 from P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T8): Pull off tuning knob and indicator ring assembly. Remove two red nylon nuts to release the bracket assembly and bonding strip. In addition free the following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off U.H.F. tuner knobs and release U.H.F. tuner as described. Take out two screws to release control panel and, if necessary, release mains lead from cleat.

Dismantling Loudspeaker: Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (four nuts).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain: 1. Deflector coils (including linearity sleeve) secured by moulded clamp. 2. C.R.T. earthing spring.

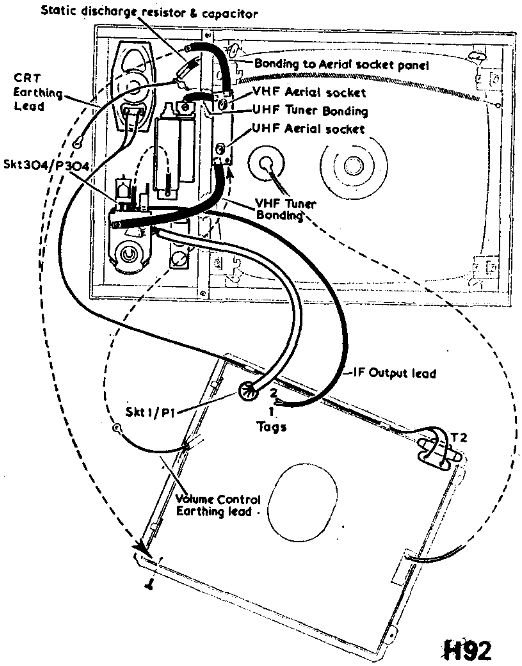
C.R.T. Replacement: Remove V.H.F. tuner and deflector coils assembly. The main interconnecting leads will allow the main board to be placed flat on workbench after releasing appropriate bonding strips and earth lead. Turn cabinet face downwards on a grit-free resilient surface, remove earthing spring and take out four screws, washers and rubber buffers securing tube, then withdraw tube from cabinet. When refitting a new tube ensure that the E.H.T. anode connector is towards top of cabinet and that the 2·2 MΩ static discharge resistor, and the 1000 pF bypass capacitor and earthing spring are in position.

Note: Ensure that all bonding strips are correctly connected when refitting assemblies.

H.M.V. Model 2646

General Description: 19-in. television receiver with tuners and chassis adapted from the B.R.C. 1400 Series, which is described in the 1968–69 volume.

Access for Service: Take off cabinet back (four screws). Release chassis from right-hand mounting brackets (two screws). Free C.R.T. earthing lead and bonding to aerial socket panel from chassis frame (one screw). Remove volume control earthing lead from aerial socket panel (one screw). The chassis can now be lifted off its hinges as described in 1400 Series information. The illustration (H92) shows the main chassis lifted off enabling all interconnections to be seen.



(H92) Interconnections Diagram—Model 2646

Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released from cabinet as described in 1400 Series information, but, in addition free the following: 1. Bonding strip from V.H.F. tuner (one screw). 2. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. V.H.F. aerial socket (three screws) and socket earth lead. 4. SKT304 from P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T4): Remove two plastic nuts to release the bracket assembly and bonding strip. In addition free the following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off knobs and release assembly (two plastic nuts). If necessary, free mains lead from cleats.

Dismantling Loudspeaker: Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (four P.V.C. end caps).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain. 1. E.H.T. anode connector and tube base connector (including spark gap earth). 2. Deflector coils (including linearity sleeve) secured by moulded clamp.

Dismantling C.R.T.: Take off the two tuners bonding strips from aerial socket panel. Remove vertical support strut and place chassis assembly flat on workbench. Unhook C.R.T. earthing spring from tag and release discharge components from under nut at top left-hand tube mounting. For C.R.T. removal, see Cathode Ray Tube Notes.

Note: When refitting assemblies ensure that all bonding strips are correctly connected and that static discharge resistor and capacitor are repositioned between C.R.T. rim and earth.

H.M.V. Model 2648

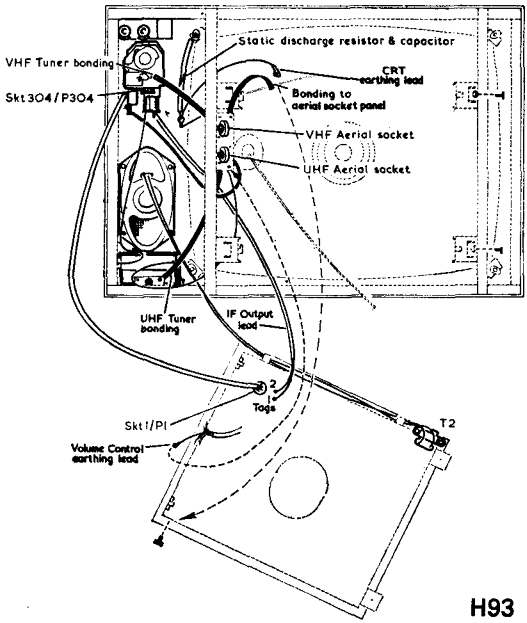
General Description: 23-in. television receiver with tuners and chassis adapted from the B.R.C. 1400 Series, which is described in the 1968–69 volume.

Access for Service: Take off cabinet back (four screws). Release chassis from right-hand mounting brackets (two screws). Free C.R.T. earthing lead and bonding to aerial socket panel from chassis frame (one screw). Remove volume control earthing lead from aerial socket panel (one screw). The chassis can now be lifted off its hinges as described in 1400 Series information. The illustration (H93) shows the main chassis lifted off enabling all interconnections to be seen.

Dismantling V.H.F. Tuner (Type 1516A/9): The V.H.F. tuner is released from the cabinet as described in 1400 Series information, but, in addition free the following: 1. Bonding strip from V.H.F. tuner (one screw). 2. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. V.H.F. aerial socket (three screws) and socket earth lead. 4. SKT304 from P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T4): Take off U.H.F. tuner bonding strip from aerial socket panel. To remove tuner assembly slacken off nut and washer securing tuner to wooden block, then raise rear of tuner to clear fixing screw. In addition free the following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off knobs and release assembly (two screws). If necessary, free mains lead from cleats.



(H93) INTERCONNECTIONS DIAGRAM—MODEL 2648

Dismantling Loudspeaker: Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (four screws).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain. 1. E.H.T. anode connector and tube base connector. 2. Deflector coils (including linearity sleeve) secured by moulded clamp.

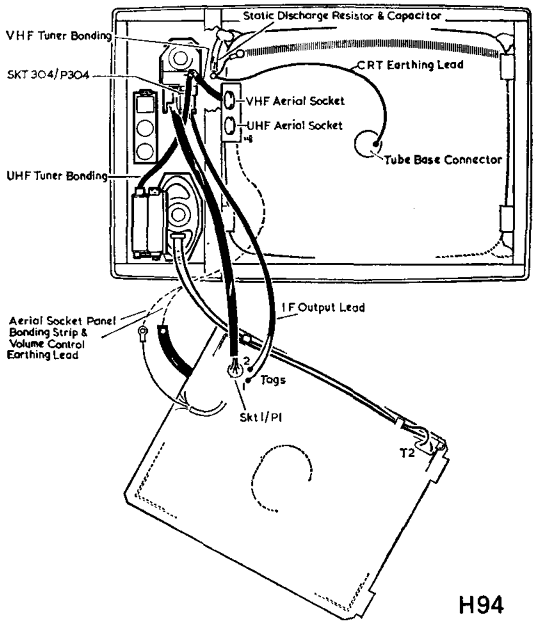
Dismantling C.R.T.: Free the main chassis from the hinges after disconnecting the appropriate leads. Unscrew the two vertical cabinet struts to provide tube removal clearance and unhook one end of the C.R.T. earthing spring. Note discharge components secured under top left-hand tube fixing screw.

Note: When refitting assemblies ensure that all bonding strips are correctly connected and that static discharge resistor and capacitor are repositioned between C.R.T. rim and earth.

H.M.V. Model 2649

General Description: 20-in. television receiver with tuners and chassis adapted from the B.R.C. 1400 Series, which is described in the 1968–69 volume.

Access for Service: Remove cabinet back (four screws). The chassis can be hinged open after releasing two screws from right-hand mounting brackets. By releasing the bonding strip to aerial socket panel and the volume control earthing lead on aerial socket panel (one screw), it can be lifted off its hinges as described in 1400 Series information. The illustration (H94) shows the chassis lifted off its hinges enabling all interconnections to be seen.



(H94) Interconnections Diagram—Model 2649

Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released from cabinet as described in 1400 Series information, but, in addition free the following: 1. Two bonding strips from V.H.F. tuner (one screw). 2. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. V.H.F. aerial socket (three screws) and socket earth lead. 4. SKT304 from P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T4): Remove two brass nuts to release tuner from cabinet. In addition free the following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off control knobs and take off two plastic nuts to release from cabinet; if necessary, release mains lead from cleat.

Dismantling Loudspeaker: Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (four plastic nuts).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T.

remain. 1. E.H.T. anode connector and tube base connector. 2. Deflector coils (including linearity sleeve) secured by moulded clamp.

C.R.T. Removal: Remove cabinet vertical support strut and swing aside chassis assembly for easy access.

Note: When refitting assemblies ensure that all bonding strips are correctly connected and that static discharge resistor and capacitor are repositioned between C.R.T. rim and earth connection as shown, also C.R.T. earthing lead is plugged on to the tube base connector.

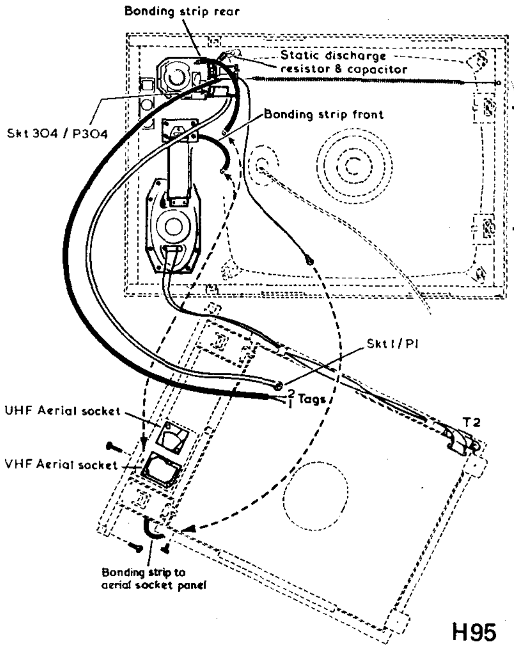
K.B. — Models KV026, KV027, KV126 and KV127

General Description: All these models employ the S.T.C. chassis type VC51, which is described in this and the 1968–69 volume.

MARCONIPHONE Model 4619B

General Description: 19-in. television receiver with tuners and chassis adapted from B.R.C.1400 Series, which is described in 1968–69 volume.

Access for Service: Remove cabinet back (four screws). The chassis can now be hinged open after releasing two screws from right-hand mounting brackets. By freeing a bonding strip, C.R.T. earth lead and earth lead on aerial socket panel, it can be lifted off its hinges for complete accessibility as described in 1400 Series information. The illustration (H95) shows the receiver with the vertical support strut freed from cabinet (two screws) and bonding strips (front and rear) released from aerial socket panel (one nut). This enables all interconnections to be seen and is a necessary preliminary to C.R.T. replacement.



(H95) INTERCONNECTIONS DIAGRAM—MODEL 4619B

Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released from cabinet as described in 1400 Series information, but, in addition free the following: 1. Bonding strip (rear) from V.H.F. tuner (one screw). 2. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. Release lead from V.H.F. aerial socket. 4. SKT304 from P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T8): Pull off knob and indicator ring. Remove two red nylon nuts to release tuner from cabinet. In addition free the

following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off knobs and release assembly (two white nylon nuts). If necessary, free mains lead from cleat.

Dismantling Loudspeaker: Remove U.H.F. tuner. Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (four end caps).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain. 1. E.H.T. anode connector and tube base connector. 2. Deflector coils (including linearity sleeve) secured by moulded clamp. 3. C.R.T. earthing spring.

C.R.T. Removal: See C.R.T. Notes 1400 Series information (in the 1968–69 volume). Note static discharge components secured under tube fixing nut.

Note: Ensure that all bonding strips are correctly connected when refitting assemblies and that static discharge resistor and capacitor are repositioned between C.R.T. rim and earth.

MARCONIPHONE — Model 4620B

General Description: 23-in. television receiver with tuners and chassis adapted from B.R.C.1400 Series, which is described in 1968–69 volume.

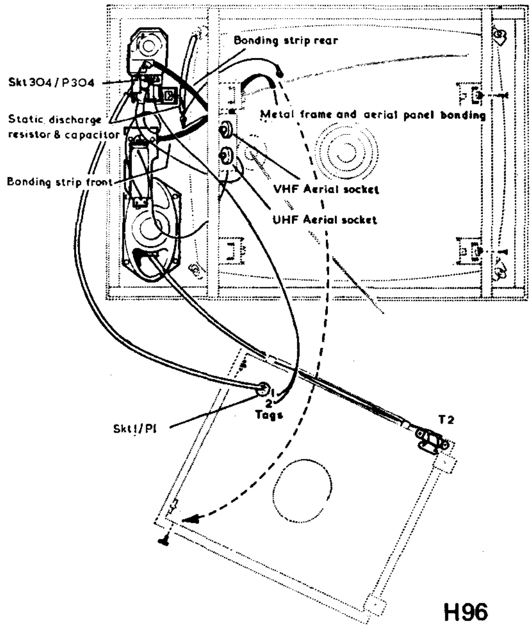
Access for Service: Remove cabinet back (five screws). The chassis can now be hinged open after releasing two screws from right-hand mounting brackets. By freeing the aerial panel bonding strip and C.R.T. earth lead from the chassis frame, it can be lifted off its hinges as described in the 1400 Series information. The illustration (H96) shows the receiver with the aerial panel bonding strip and C.R.T. earth lead released from chassis frame, and the chassis lifted off its hinges to enable all interconnections to be seen.

Dismantling V.H.F. Tuner (Type 1515): The V.H.F. tuner is released from cabinet as described in 1400 Series information, but, in addition free the following: 1. Bonding strip (rear) from V.H.F. tuner (one screw). 2. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. V.H.F. aerial socket (three screws) and socket earth lead. 4. SKT304 from P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T8): Pull off tuning knob and indicator ring assembly. Remove two red nylon nuts to release the bracket assembly and front bonding strip. In addition free the following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).

Dismantling Controls Mounting Assembly: Pull off knobs and release assembly (two white nylon nuts). If necessary, free mains lead from cleats.

Dismantling Loudspeaker: Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (four P.V.C. end caps).



(H96) Interconnections Diagram—Model 4620B

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain. 1. E.H.T. anode connector and tube base connector. 2. Deflector coils (including linearity sleeve if fitted) secured by moulded clamp.

C.R.T. Removal: Release bonding strips front and rear from aerial socket panel, then release tube earth lead from chassis frame and unhook earthing spring from tag. Remove both cabinet vertical support struts and swing aside chassis assembly for ease of access. For C.R.T. removal, see Cathode Ray Tube Notes 1400 Series information. Note static discharge components secured under tube fixing nut.

Note: Ensure that all bonding strips are correctly connected when refitting assemblies and that static discharge resistor and capacitor are repositioned between C.R.T. rim and earth. Two wooden wedges provided to support the C.R.T. must be replaced if dislodged.

MARCONIPHONE Model 4623

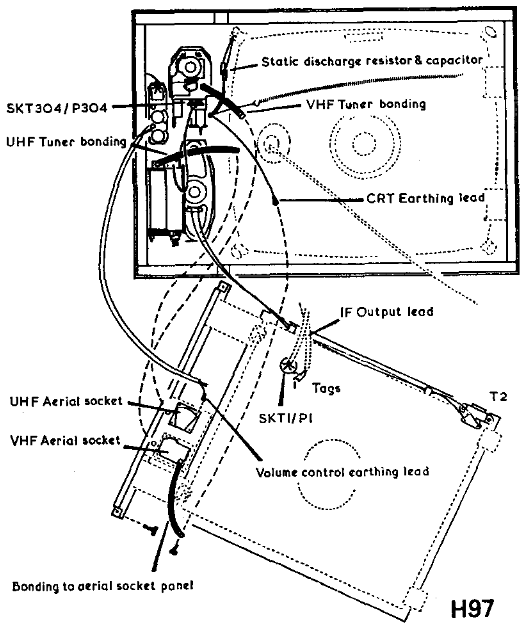
General Description: 19-in. television receiver with tuners and chassis adapted from B.R.C.1400 Series, which is described in 1968–69 volume.

Access for Service: Remove cabinet back (four screws). The chassis can be hinged open after releasing two screws from right-hand mounting brackets.

By releasing the bonding strip to aerial socket panel and C.R.T. earthing lead on chassis frame (one screw), and the volume control earthing lead on aerial socket panel (one screw), it can be lifted off its hinges as described in 1400 Series information. The illustration (H97) shows the receiver with the vertical support strut and chassis removed from cabinet (two screws), and the V.H.F. tuner and U.H.F. tuner bonding strips released from the two nuts securing aerial socket panel. This enables all interconnections to be seen and is also a necessary preliminary to C.R.T. replacement.

Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released from cabinet as described in 1400 Series information, but, in addition free the following: 1. Bonding strip from V.H.F. tuner (one screw). 2. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. V.H.F. aerial socket (three screws) and socket earth lead. 4. SKT304 from P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T4): Remove two plastic nuts to release tuner from cabinet. In addition free the following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).



(H97) Interconnections Diagram—Model 4623

Dismantling Control Mounting Assembly: Pull off control knobs and take off two plastic nuts to release from cabinet—if necessary, release mains lead from cleat.

Dismantling Loudspeaker: Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (four plastic nuts).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain. 1. E.H.T. anode connector and tube base connector. 2. Deflector coils (including linearity sleeve) secured by moulded clamp.

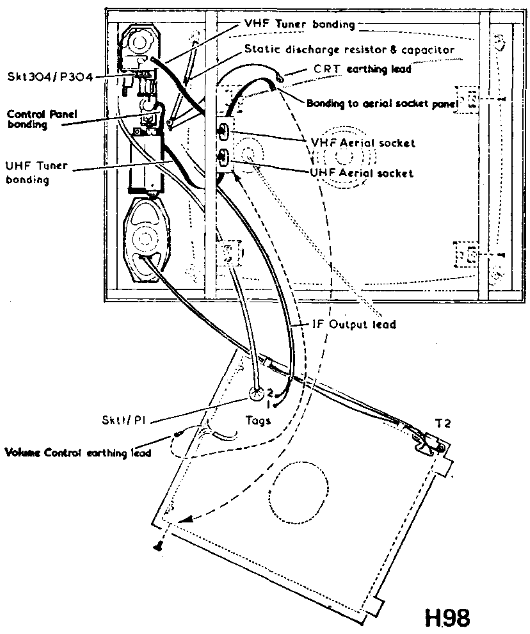
C.R.T. Removal: Remove cabinet vertical strut and swing aside chassis assembly for easy access. For C.R.T. removal, see Cathode Ray Tube Notes 1400 Series.

Note: When refitting assemblies ensure that all bonding strips are correctly connected and that static discharge resistor and capacitor are repositioned between C.R.T. rim and earth.

MARCONIPHONE Model 4624

General Description: 23-in. television receiver with tuners and chassis adapted from B.R.C.1400 Series, which is described in 1968–69 volume.

Access for Service: Remove cabinet back (four screws). The chassis can be hinged open after releasing two screws from right-hand mounting brackets. By releasing the bonding strip to aerial socket panel and C.R.T. earthing lead on chassis frame (one screw), and the volume control earthing lead on aerial socket panel (one screw), it can be lifted off its hinges as described in 1400 Series information. The illustration (H98) shows the chassis lifted off its hinges enabling all interconnections to be seen.



(H98) Interconnections Diagram—Model 4624

Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released from cabinet as described in 1400 Series information, but, in addition free the following: 1. Bonding strip from V.H.F. tuner (one screw). 2. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. V.H.F. aerial socket (three screws) and socket earth lead. 4. SKT304 from P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T4): Remove two brass nuts to release tuner from cabinet. In addition free the following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off control knobs and then release V.H.F. tuner. Remove bonding strip on control panel and take off two plastic nuts to release from cabinet. If necessary, release mains lead from cleat.

Dismantling Loudspeaker: Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (four plastic nuts).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain: 1. E.H.T. anode connector and tube base connector (including spark gap earth). 2. Deflector coils (including linearity sleeve) secured by moulded clamp.

C.R.T. Removal: Remove both cabinet vertical support struts and swing aside chassis assembly for easy access. For C.R.T. removal, see Cathode Ray Tube Notes 1400 Series.

Note: When refitting assemblies ensure that all bonding strips are correctly connected and that static discharge resistor and capacitor are repositioned between C.R.T. rim and earth.

MURPHY — Models V1910U, V1913, V2310U and V2311C

General Description: All these models are electrically similar to the Bush TV161U, etc., range of receivers, which are fully described earlier in this volume.

MURPHY — Models V1914, V2014, V2312 and V2314

General Description: All these models are electrically similar to the Bush TV171, etc., series of receivers, which are described in earlier pages of this volume.

PYE

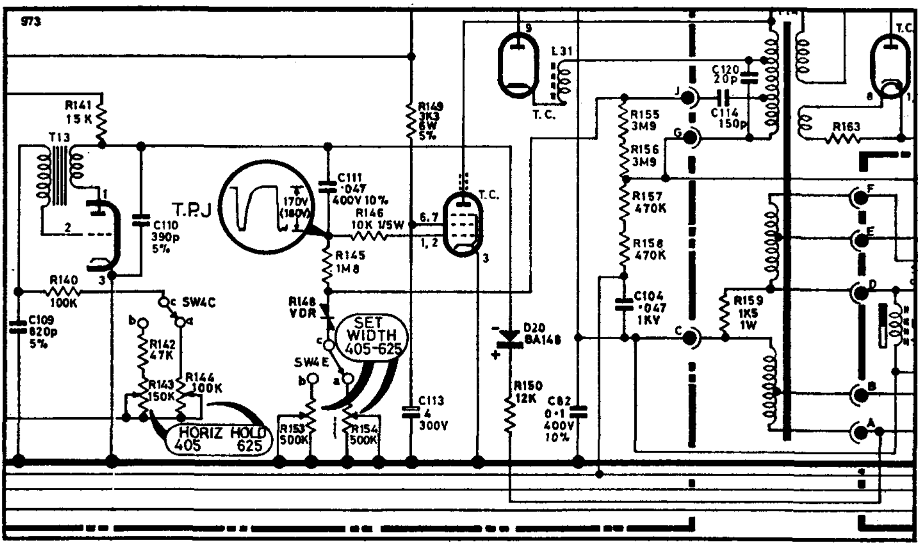
Models 58, 59, 62, 63 and 64 (368 TV Chassis)

General Description: These models incorporate the Pye Group 368 chassis which employ the "Multiband" silicon tuner and separate I.F. panel. The circuit is designed for use on an A.C. supply of 200/210 and 230/250V. Under no circumstances connect to a D.C. supply or serious damage will result.

Note: The circuit diagram and layout details of the "Multiband" tuner are contained in the 1968–69 volume as part of the information relating to the Pye '67 chassis.

Cathode Ray Tube Types: Models 58 and 62, 19 in., A47/26WR; model 63, 20 in., A50/120WR; models 59 and 64, 23 in., A59/23WR.

Intermediate Frequencies: 405, 34·65MHz (vision) and 38·15MHz (sound); 625, 39·5MHz (vision) and 33·5MHz (sound).



W43

(W43) Modified Timebase Panel "GA"—368 T.V. Chassis

Adjustments (Vertical Linearity 1 and 2): These are pre-set controls located through holes in the copper of the timebase panel. Adjust by means of a small screwdriver, using a suitable test pattern picture. Linearity 1 controls overall linearity and linearity 2 the top of picture linearity.

Adjustments (Vertical Amplitude): This control should be set to make the picture extend symmetrically, to give the correct picture height.

Adjustments (Horizontal Linearity): The horizontal linearity control (L32) is located on the front of the timebase panel. Adjust until the first 30 per cent of scan is equal to the last 30 per cent of scan.

Adjustments (Width—625 and 405): Ensure first that mains input voltage and horizontal linearity adjustments are correct. Adjust both set width controls in turn, commencing at minimum (fully anticlockwise) and advancing until scan ceases to increase. At this point there should be excessive scan. Return both set width controls to minimum and connect a 20,000 o.p.v. D.C. voltmeter (Avo 8 or similar) between L.O.P.T. socket pin G and chassis; then re-adjust the controls to obtain a reading of 945 V D.C. on either system.

Adjustments (Picture Centring): Picture centring is effected by the two magnets (M1, M2) situated on the rear of the deflector coils. Rotate the magnets independently until the picture is correctly positioned on the screen.

Adjustments (Picture Rotation): Slacken the clamping screw at rear of deflector coils and level the picture by rotating the coils in the required direction.

Adjustments (Focus): Optimum focus is obtained by connecting the blue jumper lead from pin 4 of the C.R.T. to tag 42 (boost), 43 (H.T.), or 44 (chassis) on the timebase panel.

Adjustments (Pre-set Contrast—625 and 405): These controls should be set so that the D.C. volts developed across R20, with an input signal greater than 1 mV, are 1.8 V (405) and 2·9 V (625). Slight re-adjustment should then be made as necessary to give equal contrasts on both systems.

Note: Cross-modulation problems on strong signals may result if the control settings are too high.

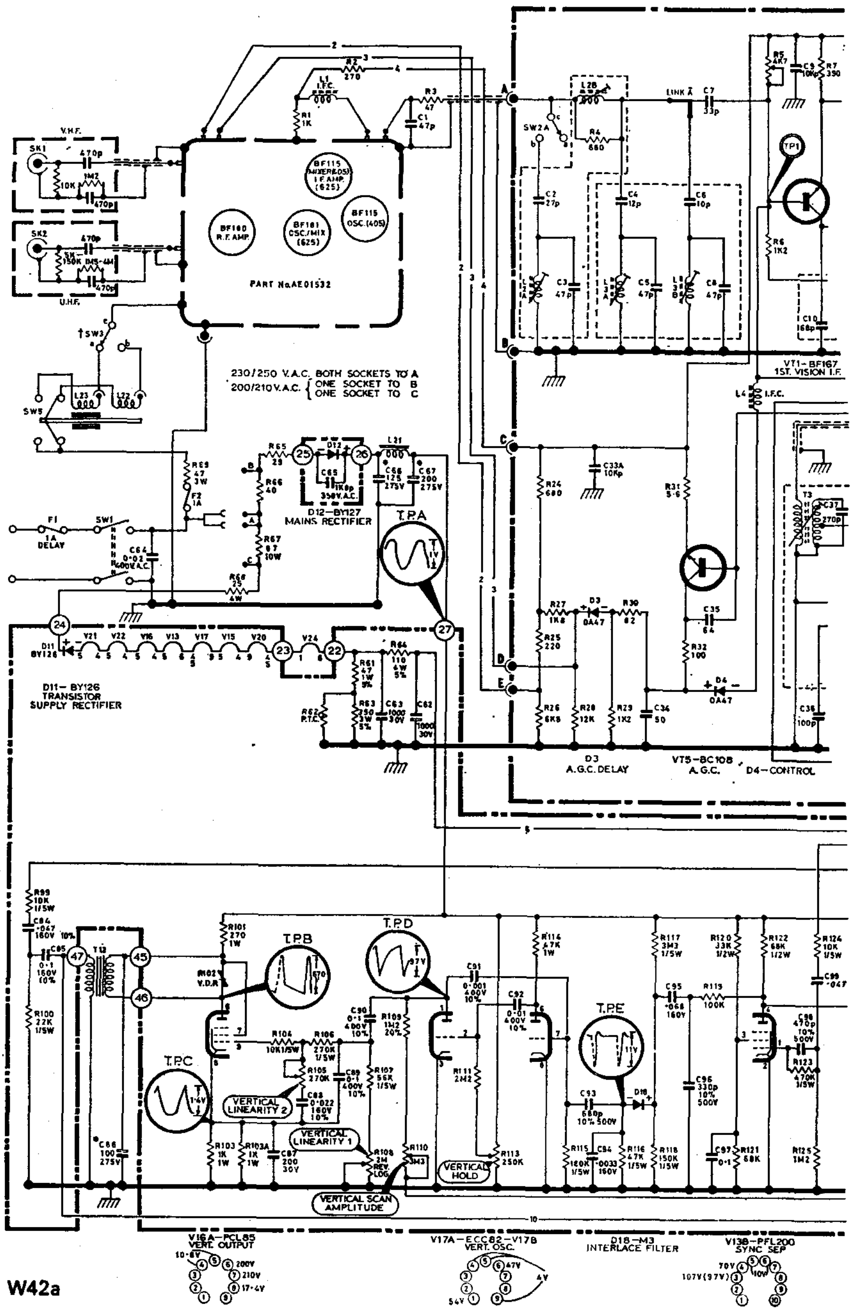
Mechanical Data (Note): After switching the receiver off, the final anode connected on the glass bulb of the C.R.T. should be short-circuited to chassis before any work is carried out.

Mechanical Data (To Lower Chassis): 1. Remove back cover. 2. Remove the two top chassis fixing screws. 3. The chassis may now be lowered to the horizontal position to enable normal service to be carried out.

Mechanical Data (To Remove Chassis): 1. Raise the chassis (approximately to the half-way position) until the slots in the cabinet hinge brackets permit the chassis to be withdrawn. 2. If it should be desired to completely detach the chassis, e.g. for tube replacement, it will be necessary to remove or disconnect: (*a*) two small front control knobs and control bracket; (*b*) speaker leads; (*c*) solenoid leads; (*d*) tuner earthing braid; (*e*) two three-pin sockets from I.F. panel; (*f*) aerial panel; (*g*) E.H.T. cavity and C.R.T. base connectors; (*h*) scan coil socket; (*i*) tube strap black lead from terminating post on timebase panel.

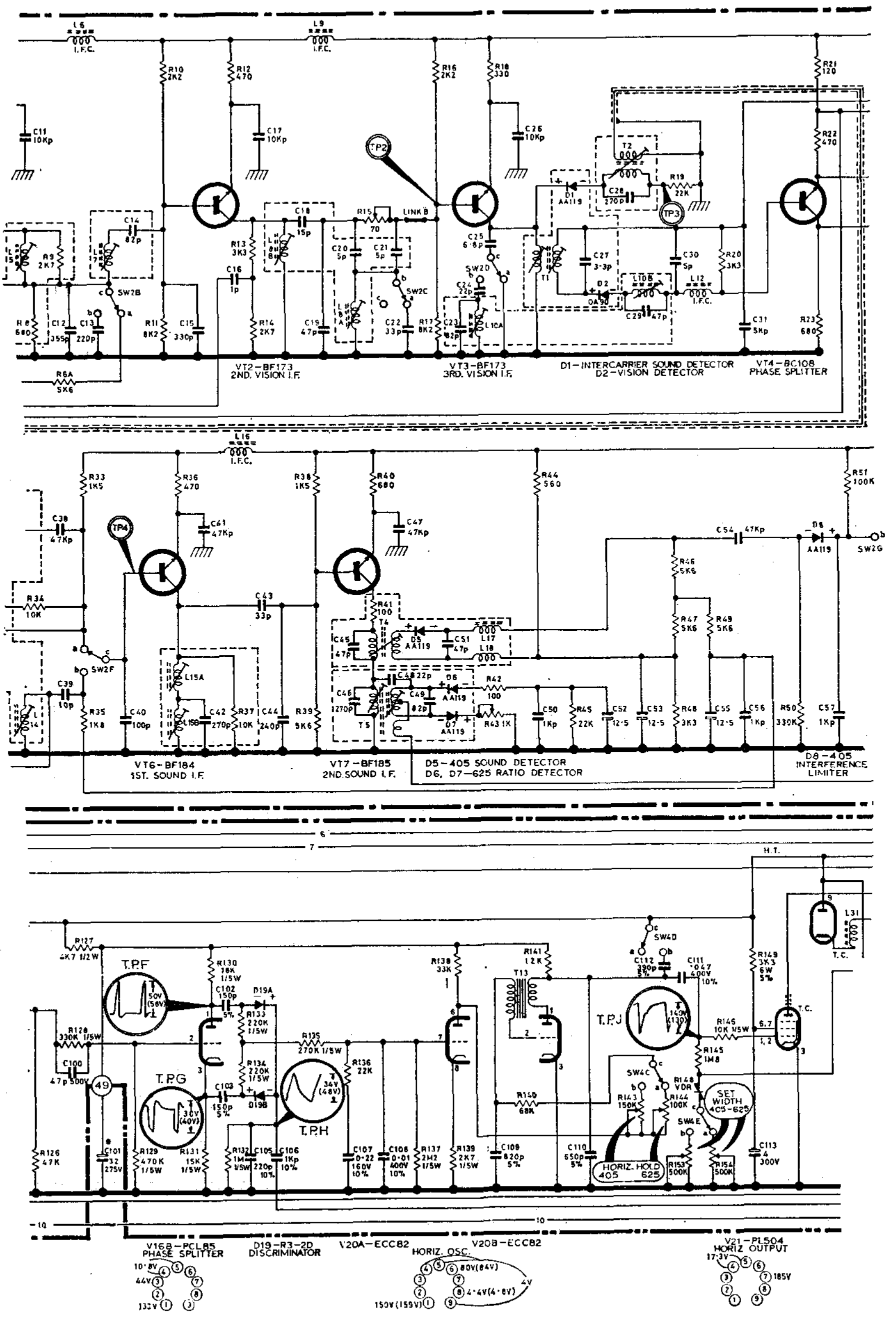
Mechanical Data (To Remove L.O.P.T. Assembly): 1. Lower chassis. 2. Disconnect E.H.T. cavity connector, the two valve top cap connectors and two sockets on timebase panel. 3. Remove the self-tapping screw and carefully withdraw L.O.P.T., at the same time releasing the E.H.T. lead retaining grommet.

Circuit Diagram Correction: Pin 5 of the C.R.T. should be connected to the other end of C124/R164. (*See diagram W42c*)



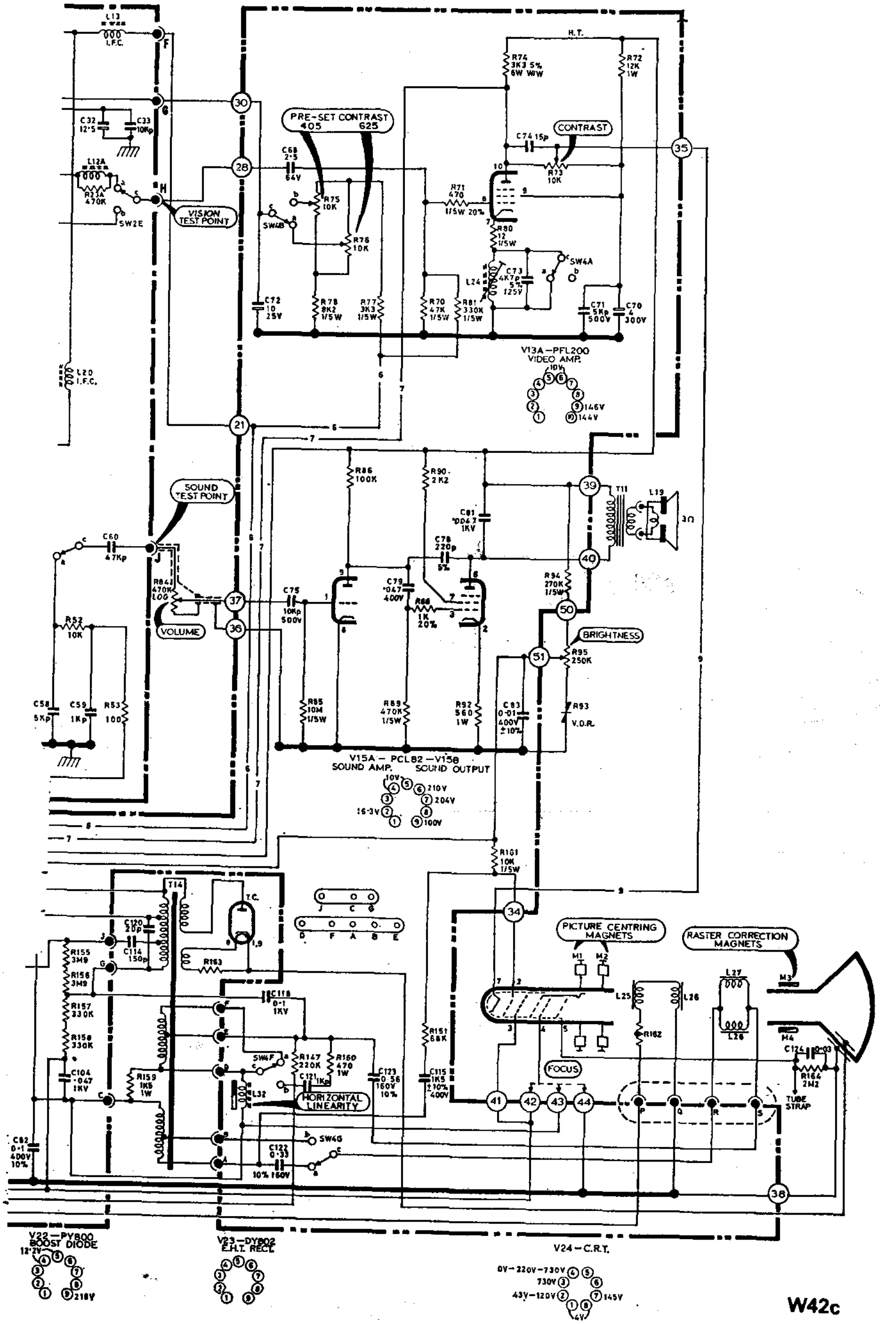
W42a

(W42a) Circuit Diagram—368 T.V. Chassis (Part)

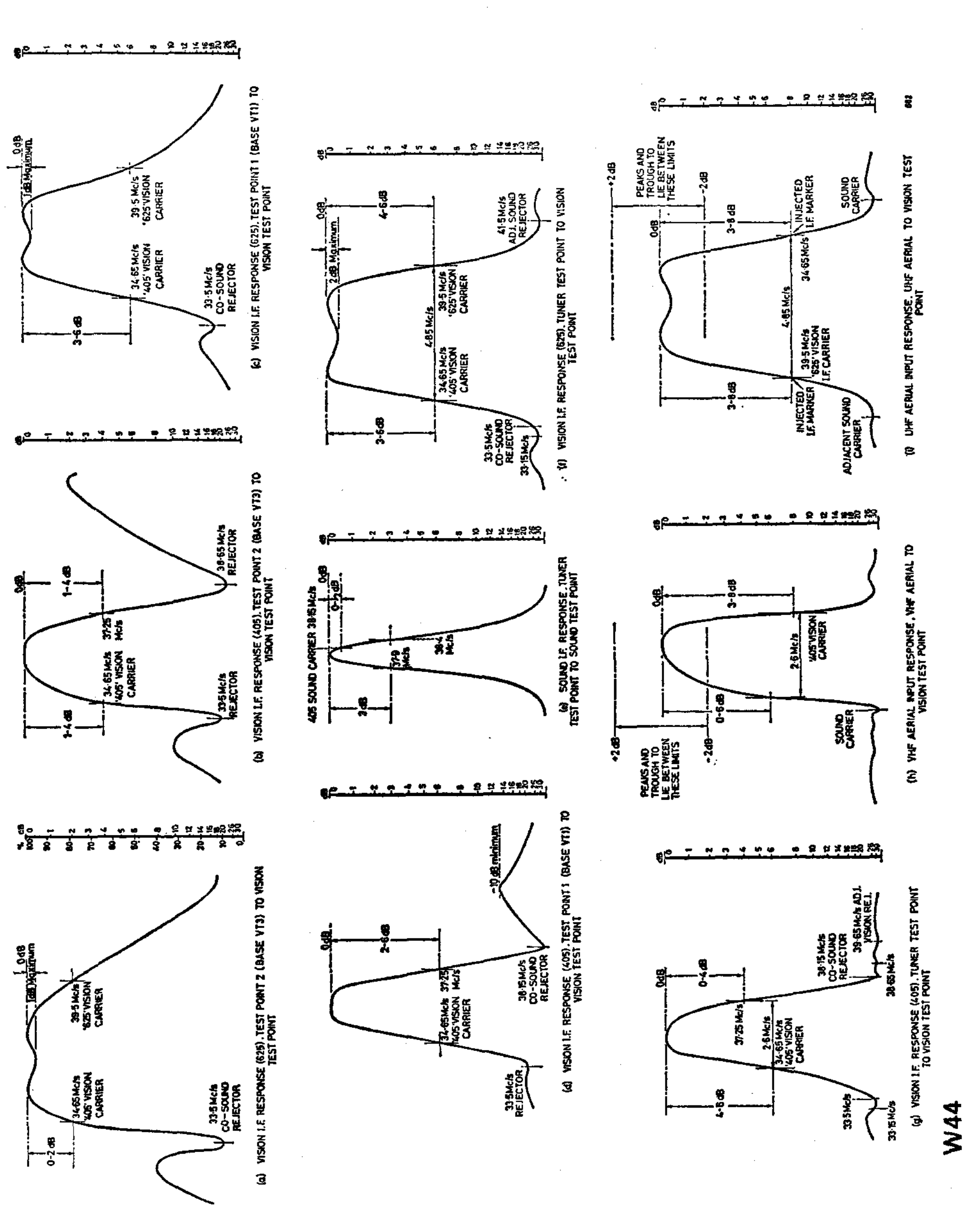


W42b

(W42b) Circuit Diagram—368 T.V. Chassis (Part)



(W42c) Circuit Diagram—368 T.V. Chassis (Continued)



(W44) RESPONSE CURVES—368 T.V. CHASSIS

Mechanical Data (To Disconnect C.R.T.): 1. Lower chassis. 2. Release aquadag earthing strap and disconnect black leads to C.R.T. base connector and timebase panel 3. Pull off E.H.T. cavity connector and C.R.T. base connector; also unplug deflector coils.

Mechanical Data (To Detach I.F. Panel): 1. Remove four-pin and two three-pin sockets. 2. Slacken the two Phillips self-tapping screws on the right-hand side and carefully disengage system switch link.

Mechanical Data (To Remove Tuner): 1. Turn channel selector knob so that I.T.A. (index spot) or pointer is at bottom centre. 2. Lower chassis and disconnect: (*a*) two three-pin sockets from I.F. panel; (*b*) solenoid leads; (*c*) tuner earthing braid, (*d*) aerial panel. 3. Remove channel selector knob by depressing the spring-loaded key. 4. Release tuner by removing two fixing screws, one at top and one at left-hand side.

Circuit Description (A.G.C.): *See circuit extract diagram* (*W45*).

With the receiver set for maximum gain and a weak signal applied, the A.G.C. transistor (VT5) is operating in a fully bottomed state (i.e. conducting heavily), thus causing its collector to become negative with respect to chassis.

Under these conditions, D4 is conducting and appears as a short-circuit transferring any change in VT5 collector volts to the base of VT1, the first I.F. amplifier, whilst D3 is cut off. As the signal strength is increased, or the setting of the pre-set contrast control is made more negative, the current passing through VT5 will decrease, causing its collector and also the base of VT1 to become less negative, thus reducing the stage gain.

When the collector of VT5 reaches a pre-determined voltage, D3 will conduct and D4 will become cut off. Under these conditions, the gain of the I.F. amplifier stage is fixed at some low value, whilst D3 conducting is effectively a short-circuit and now transfers the A.G.C. voltage to the base of the R.F. transistor (VT1 in the tuner).

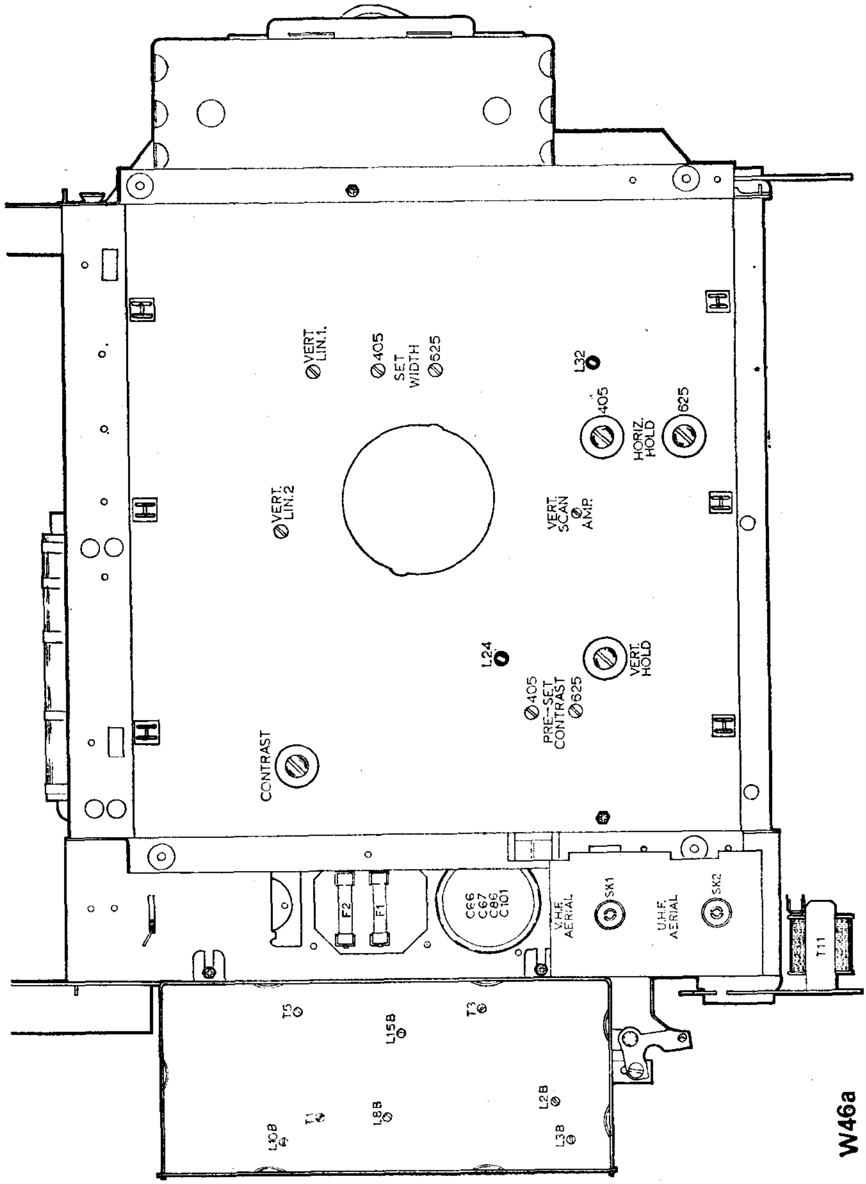
The A.G.C. to the R.F. stage is therefore delayed in order to give optimum signal to noise performance.

The pre-set contrast control provides a manually controlled voltage which determines the A.G.C. operating point, and the A.G.C. voltage is therefore the summation of the signal and manual control voltages.

TRANSISTOR VOLTAGE DATA

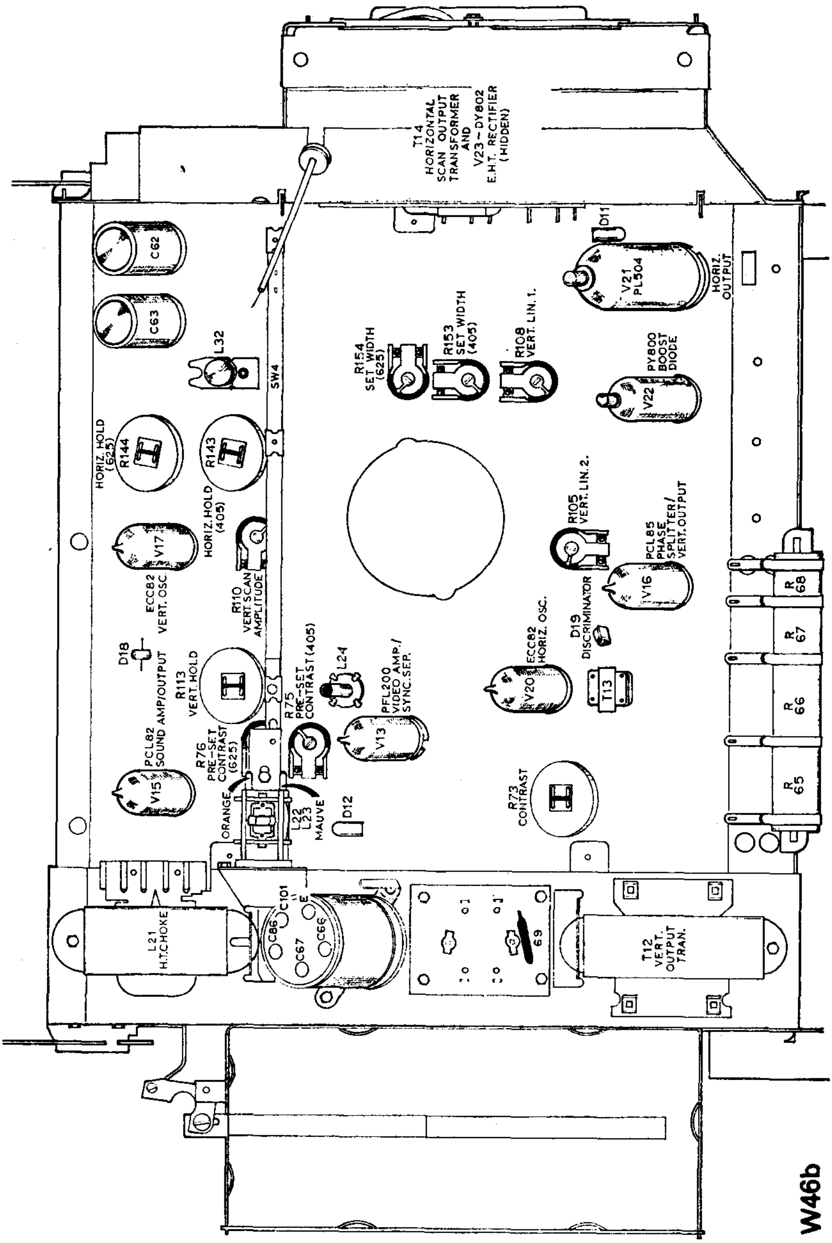
Code No.	*Collector*	*Base*	*Emitter*	*Code No.*	*Base*
VT1	6·75 (8·7)	15·4 (12·7)	16·1 (13·4)	Pin "D"	12·0 (3·4)
VT2	0	13·9	14·7	Pin "E"	12·9 (4·3)
VT3	0	14·4	15·2	Pin "F"	18·0
VT4	9·0 (3·0)	9·3 (14·4)	10·4 (15·25)		
VT5	15·7 (3.15)	16·74 (17·3)	17·6 (17·75)		
VT6	0	14·25	15·5		
VT7	0·5	14·0	14·7		

All the above voltage readings are negative with respect to chassis and taken with Avo model 8, no signal input, SW2 in "405" position with pre-set contrast at maximum gain. Readings in brackets are those which differ when pre-set contrast is set for minimum gain.



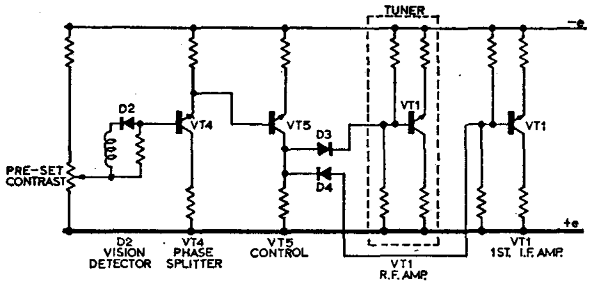
W46a

(W46a) CHASSIS REAR VIEW—368 T.V. CHASSIS



W46b

(W46b) Chassis View (Lowered Position)—368 T.V. Chassis



W45

(W45) A.G.C. DIAGRAM—368 T.V. CHASSIS

Tuner (General): *See diagram W48.* When dispatched from the factory, the rotary tuner is "set" so that the two B.B.C.1 positions can only be tuned to channels 1–5; the two I.T.A. positions to channels 6–13; and the two B.B.C.2 positions to channels 21–68.

In some areas, however, it may be required to change this combination, e.g. to receive a B.B.C.1 transmission in Band III or to obtain an additional 625 transmission. This is achieved quite simply by rotating through 180 degrees or removing one of the cam buttons at the rear of the tuner and/or rearranging the position of the system screws on the tuner front cam. The cam buttons determine the band coverage and the system screws the line system.

A number of variations are illustrated as follows:

A – As dispatched from the factory
B – B.B.C.1 converted to Band III
C – I.T.A. converted to Bands IV/V
D – B.B.C.2 converted to Band I (625)
E – B.B.C.2 converted to Band III (625)
F – I.T.A. converted to Band I

In each case the channel selector knob is viewed with the I.T.A. position having a small index spot below the "T" at top centre, and the two cams in the same relative position, viewed from rear and front respectively.

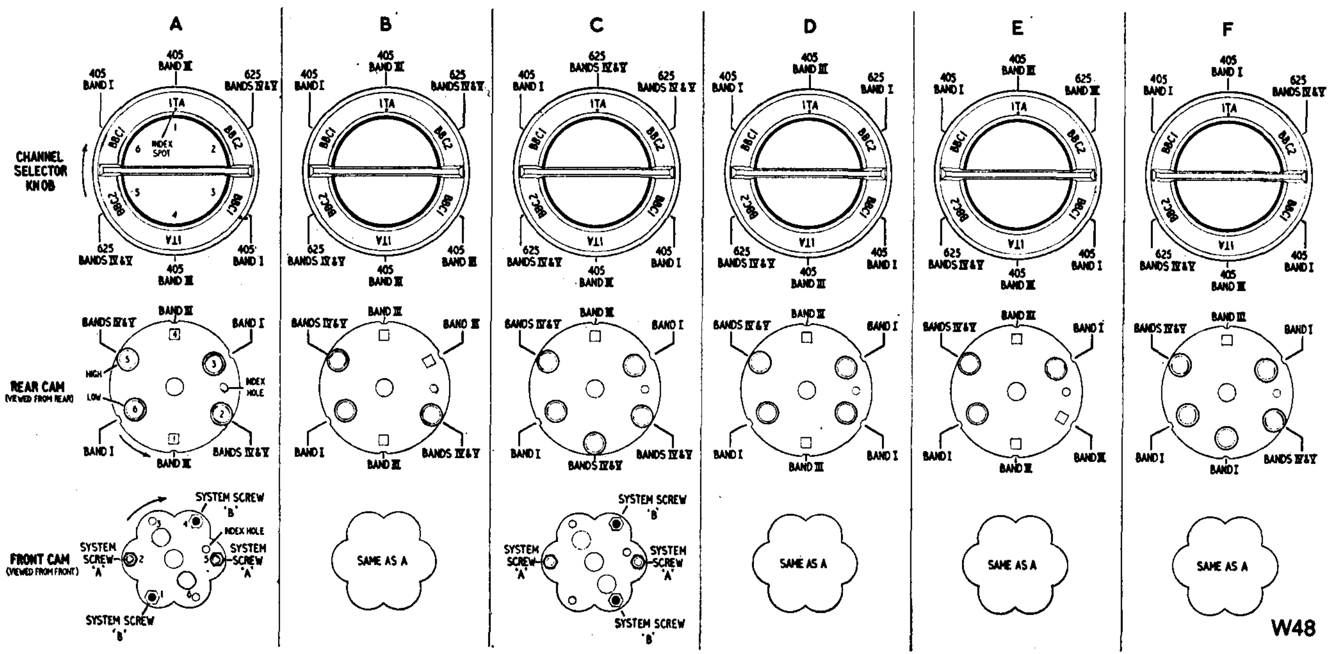
The band range is selected at bottom centre of the rear cam, with the cam button: (*a*) in the low (inner) position for Band I; (*b*) removed for Band III; (*c*) in the high (outer) position for Bands IV/V.

A "parking space" is provided on the tuner bracket adjacent to this cam for a button which is out of use.

The line system is operated by screws placed ***in alternate order*** behind the front cam (system screw "A") or in front of the front cam (system screw "B)".

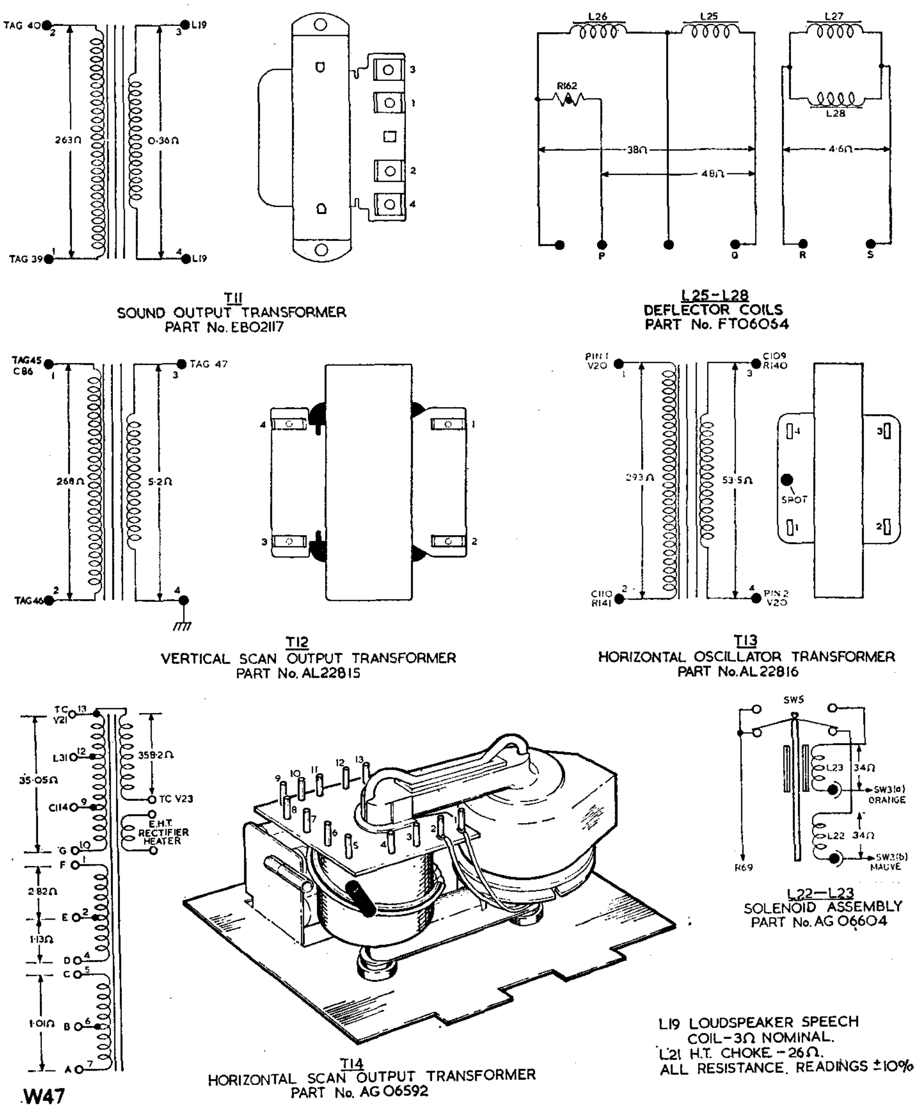
Tuner (To Convert A To B): Remove back cover, turn channel selector to I.T.A. (index spot), pull out cam button 3 (from rear cam) and "park" in square hole adjacent to fine tuner spindle (see diagram W48).

Tuner (To Convert A To C): *See diagram W48.* Remove back cover, turn channel selector so that I.T.A. (index spot) or pointer is at *bottom* centre, then remove knob by depressing the spring-loaded key, which is accessible from inside the cabinet.



(W48) Tuner Band and Channel Selection—368 T.V. Chassis

With the illustration inverted to correspond with the position of the tuner, remove system screw "B" from position 1 and re-fit in position 6 through the knob aperture. Replace channel selector knob and turn I.T.A. (index spot) or pointer to top centre. Insert additional cam button in position 1 (of the rear cam) in the "high" position.



(W47) D.C. Resistance and Connections of Windings—368 T.V. Chassis

Tuner (To Convert A To D): Remove back cover, turn channel selector to I.T.A. (index spot), pull out cam button 2 (from rear cam), rotate through 180 degrees and replace in "low" position (see diagram W48).

Tuner (To Convert A To E): *See diagram W48.* Remove back cover, turn channel selector to I.T.A. (index spot), pull out cam button 2 (from rear cam) and "park" in square hole adjacent to fine tuner spindle.

Tuner (To Convert A To F): Remove back cover, turn channel selector to I.T.A. (index spot) and insert additional cam button in position 1 (of the rear cam) in the "low" position (see diagram W48).

Modifications:

A number of component changes have been made, the most recent being the addition of a shaping diode (D20) and associated resistors (R142, R150); also the deletion of switch section (SW4D) and capacitor (C112). These necessitated a minor modification to the timebase panel board and any panel so modified has been coded with the letters GA. A circuit extract shows the position of these new components in the modified timebase circuit.

Resistor Variations: R94, 470k; R127, 1k; R140, 100k, or 180k; R142, 47k or 100k if R140 is 180k; R150, 12k; R157, 47k; R158, 470k.

Capacitor Variations: C110, 390pF; C122A, 560pF fitted between (*a*) and (*c*) of SW4G.

Transistor Variations: VT1, BF196; VT2, VT3, BF197; VT4, VT5, BC148; VT6, BF194; VT7, BF195.

R.G.D. Models RV227, RV325 and RV328

General Description: All these models employ the S.T.C. chassis type VC51, which is described in the 1968–69 volume; modifications to the VC51 chassis are also given in this volume.

SOBELL Models 1032 and 1033

General Description: These models are electrically similar to the G.E.C. models 2032 and 2033, which are described earlier in this volume.

SOBELL Models 1038 and 1039

General Description: These models are electrically similar to the G.E.C. models 2038 and 2039, which are fully described earlier in this volume.

S.T.C. Television Chassis Type VC51

General Description: Chassis type VC51 (see 1968–69 volume) is similar to chassis type VC4 (see 1967–68 volume), but, stroke numbers are now affixed to the VC51 chassis, and these chassis are briefly described below.

VC51: This chassis is very similar to VC4 and has a rocker-type system switch knob. It was fitted, in the later states of production, to the following receivers normally fitted with a VC4: KVO13, KVO15, KVO17, KV117, RV213, RV215, RV217, RV315, RV318.

Note: The chassis that follow have their system switch controlled by a rotary knob.

VC51/1: Used in the Deep Scene receivers, this chassis has a Bowden cable to work the system switch, and dial lights wired in the heater chain as shown in the VC51 information in the 1968–69 volume: KVO24, KV124 and RV224.

VC51/2: This is now the basic chassis and has a rotary system switch knob. Used in models: KVO25/125, KVO26/126, KVO27, RV227, RV225/325, KV128, RV328.

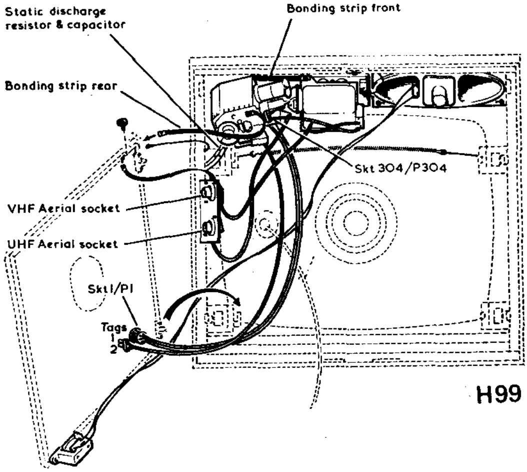
VC51/4: Electrically a VC51/2, the system switch action on this chassis has been improved. The pivot point for the lever that moves the switch proper has been repositioned behind the pin on the switch (on VC51/2 the pivot is in front of the pin), thus the force applied to the control knob need be far less on VC51/4. The 405 position marked on the fascia panel is now on the right because of this change.

ULTRA Model 6648

General Description: 19-in. television receiver with tuners and chassis adapted from B.R.C.1400 Series, which is described in 1968–69 volume.

Access For Service: Remove cabinet back (four screws). Release chassis from right-hand mounting brackets (two screws). The chassis can be hinged open or lifted off its hinges for complete accessibility as described in 1400 Series information. The illustration (H99) shows the receiver with the tuner, aerial panel bonding strips and C.R.T. earth released from main chassis (one screw). This enables all interconnections to be seen and is also a necessary preliminary to C.R.T. replacement.

Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released from cabinet as described in 1400 Series information, but, in addition free the following: 1. Bonding strip (rear) from main chassis frame (one screw). 2. Bonding strip (front) from U.H.F. tuner (one screw). 3. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 4. V.H.F. aerial socket (three screws) and earthing link. 5. SKT304 from P304 (V.H.F. tuner).



(H99) Interconnections Diagram—Model 6648

Dismantling U.H.F. Tuner (Type T10): Pull off tuning knob and indicator ring assembly; remove V.H.F. tuner then take out two red nylon nuts to release tuner bracket. In addition free the U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off knobs and remove U.H.F. tuner, then release assembly (two white nylon screws). If necessary, free mains lead from cleat.

Dismantling Loudspeaker: Unplug loudspeaker leads from output transformer and remove leads from chassis cleats. Release loudspeaker (two screws).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain. 1. E.H.T. anode connector and tube base connector (including spark gap earth). 2. Deflector coils (including linearity sleeve) secured by moulded clamp. 3. C.R.T. earthing spring.

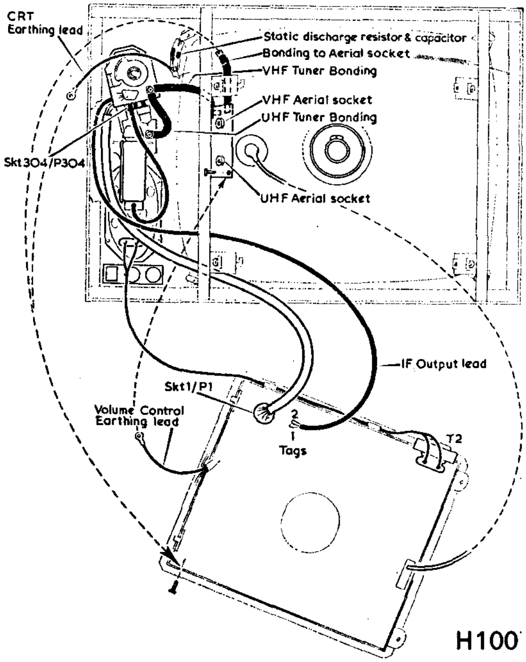
Removal of C.R.T.: See C.R.T. notes in 1400 Series information in the 1968–69 volume. Note static discharge resistor and capacitor between C.R.T. rim and earth.

Note: Ensure that all bonding strips are correctly connected when refitting assemblies.

ULTRA — Model 6649

General Description: 23-in. television receiver with tuners and chassis adapted from B.R.C.1400 Series, which is described in 1968–69 volume.

Access for Service: Remove cabinet back (five screws). The chassis can be hinged open after taking out two screws from right-hand mounting brackets.



(H100) INTERCONNECTIONS DIAGRAM—MODEL 6649

Release the bonding strip to aerial socket panel and C.R.T. earthing lead from chassis frame (one screw), also volume control earthing lead on aerial socket panel (one screw), then unsolder coaxial lead on V.H.F. aerial socket. The chassis can now be lifted off its hinges as described in 1400 Series information, and be placed flat on workbench after freeing leads from cleats on deflector coils assembly. The illustration (H100) shows the chassis lifted off its hinges enabling all interconnections to be seen; this is also a necessary preliminary to C.R.T. replacement.

Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released from cabinet as described in 1400 Series information in the 1968–69 volume, but, in addition free the following: 1. Bonding strips on V.H.F. tuner (one screw). 2. SKT1/P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. Release V.H.F. aerial socket (three screws) and earth connection. 4. SKT304/P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T8): Pull off tuning knob and indicator assembly; the outer dressing ring is fixed to control panel. Remove two plastic nuts to release tuner and bonding strip from cabinet. In addition free the following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off knobs and release assembly (two plastic screws). If necessary, free mains lead from cleats.

Dismantling Loudspeaker: Unplug loudspeaker leads from T2 (main

chassis) and remove leads from chassis cleats. Release loudspeaker (four P.V.C. end caps).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain. 1. E.H.T. anode connector and tube base connector. 2. Deflector coils (including linearity sleeve) secured by moulded clamp.

C.R.T. Removal: Hinge open chassis and release V.H.F. Tuner bonding strip from aerial socket panel, then unsolder coaxial lead from V.H.F. aerial socket. Unhook C.R.T. earthing lead from tag and release discharge components from under nut at top left-hand tube mounting. Lift chassis off its hinges and then remove both cabinet vertical support struts. For further information see Cathode Ray Tube Notes (category 2), 1400 Series information in the 1968–69 volume.

Note: A wooden wedge is fitted to the floor of the cabinet to support the tube and must be replaced if dislodged.

Replacing assemblies: When refitting assemblies ensure that all bonding strips are correctly connected and that static discharge resistor and capacitor are repositioned between C.R.T. rim and earth.

ULTRA — Model 6654

General Description: 19-in. television receiver with tuners and chassis adapted from the B.R.C.1400 Series, which is described in 1968–69 volume.

Access For Service: Remove cabinet back (four screws). The chassis can be hinged open after releasing two screws from right-hand mounting brackets; or, by releasing two bonding strips and C.R.T. earth lead, lifted off its hinges for complete accessibility as described in 1400 Series information in the1968–69 volume. The two tuners, loudspeaker and controls mounting bracket are fitted to a metal plate which is secured to the cabinet as a complete assembly by four screws. The illustration (H101) shows the receiver with the vertical support strut freed from the cabinet (two screws) and tuner bonding strip rear and C.R.T. earth lead released from chassis frame (one screw). This enables all interconnections to be seen and is also a necessary preliminary to C.R.T. replacement.

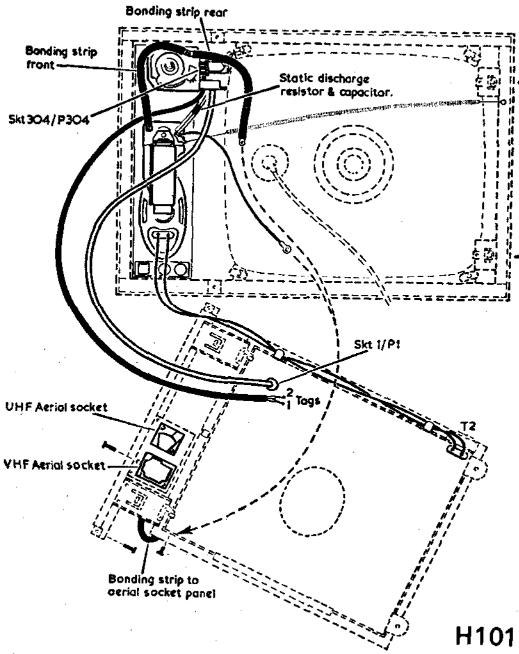
Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released from cabinet as described in 1400 Series information, but, in addition free the following: 1. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 2. Release lead from V.H.F. aerial socket. 3. SKT304 from P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T8): Pull off knob and indicator ring. Remove two slotted nuts to release tuner, bonding strip front, and tag securing C.R.T. earthing spring and discharge components. In addition free the

following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off knobs and release assembly (two white nylon nuts). If necessary, free mains lead from cleat.

Dismantling Loudspeaker: Remove U.H.F. tuner. Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (four screws).



(H101) INTERCONNECTIONS DIAGRAM—MODEL 6654

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain. 1. E.H.T. anode connector and tube base connector. 2. Deflector coils (including linearity sleeve) secured by moulded clamp.

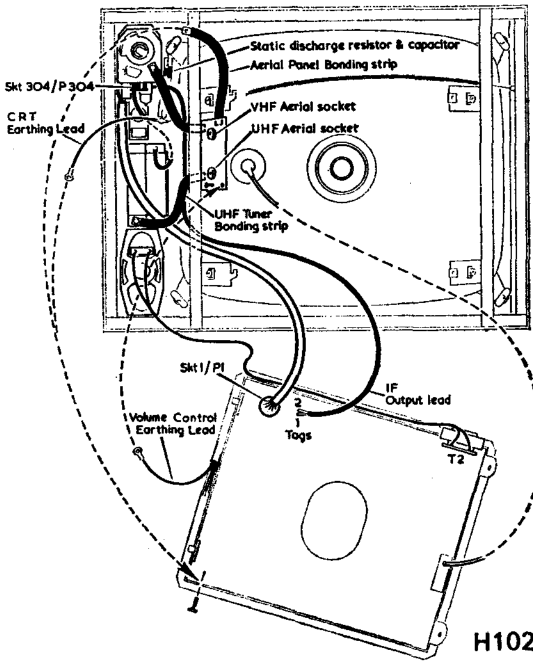
C.R.T. Removal: Disconnect C.R.T. earthing spring and discharge components, see also Cathode Ray Tube Notes (category 1), 1400 Series information in the 1968–69 volume, page 534.

Note: Ensure that all bonding strips are correctly connected when refitting assemblies, also static discharge resistor and capacitor must be repositioned between C.R.T. mounting bracket and earth.

ULTRA Model 6657

General Description: 23-in. television receiver with tuners and chassis adapted from B.R.C.1400 Series, which is described in 1968–69 volume.

Access For Service: Remove cabinet back (four screws). The chassis can be hinged open after removing two screws securing it to the right-hand mounting brackets. For complete accessibility detach the aerial panel bonding strip and C.R.T. earthing lead from top left-hand corner of chassis, release the volume control earthing lead from lower corner of aerial socket-panel and lift the chassis off its hinges as described in 1400 Series information in the 1968–69 volume. The illustration (H102) shows the main chassis lifted off its hinges with the aerial panel bonding strip, C.R.T. earthing lead and volume control earthing lead disconnected. Also shown are the tuner bonding strips and the plug and socket connections between chassis and rest of receiver.



(H102) INTERCONNECTIONS DIAGRAM—MODEL 6657

Dismantling V.H.F. Tuner (Type 1516): The V.H.F. tuner is released from cabinet as described in 1400 Series information, but, in addition free the following: 1. V.H.F. tuner bonding strip from tuner (one screw). 2. SKT1 from P1 (main chassis) and I.F. output lead from tags 1 and 2 (main chassis). 3. V.H.F. aerial socket (three screws) and earthing link. 4. SKT304 from P304 (V.H.F. tuner).

Dismantling U.H.F. Tuner (Type T4): Remove two red nylon nuts to release tuner from cabinet. In addition free the following: 1. SKT304 from P304 (V.H.F. tuner). 2. U.H.F. aerial socket (two screws).

Dismantling Control Mounting Assembly: Pull off knobs and release assembly (two white nylon nuts). If necessary free mains lead from cabinet cleat.

Dismantling Loudspeaker: Unplug loudspeaker leads from T2 (main chassis) and remove leads from chassis cleats. Release loudspeaker (four P.V.C. end caps).

Dismantling Main Chassis: After removing or disconnecting the above assemblies, the following interconnections between main chassis and C.R.T. remain. 1. E.H.T. anode connector and tube base connector. 2. Deflector coils (including linearity sleeve) secured by moulded clamp.

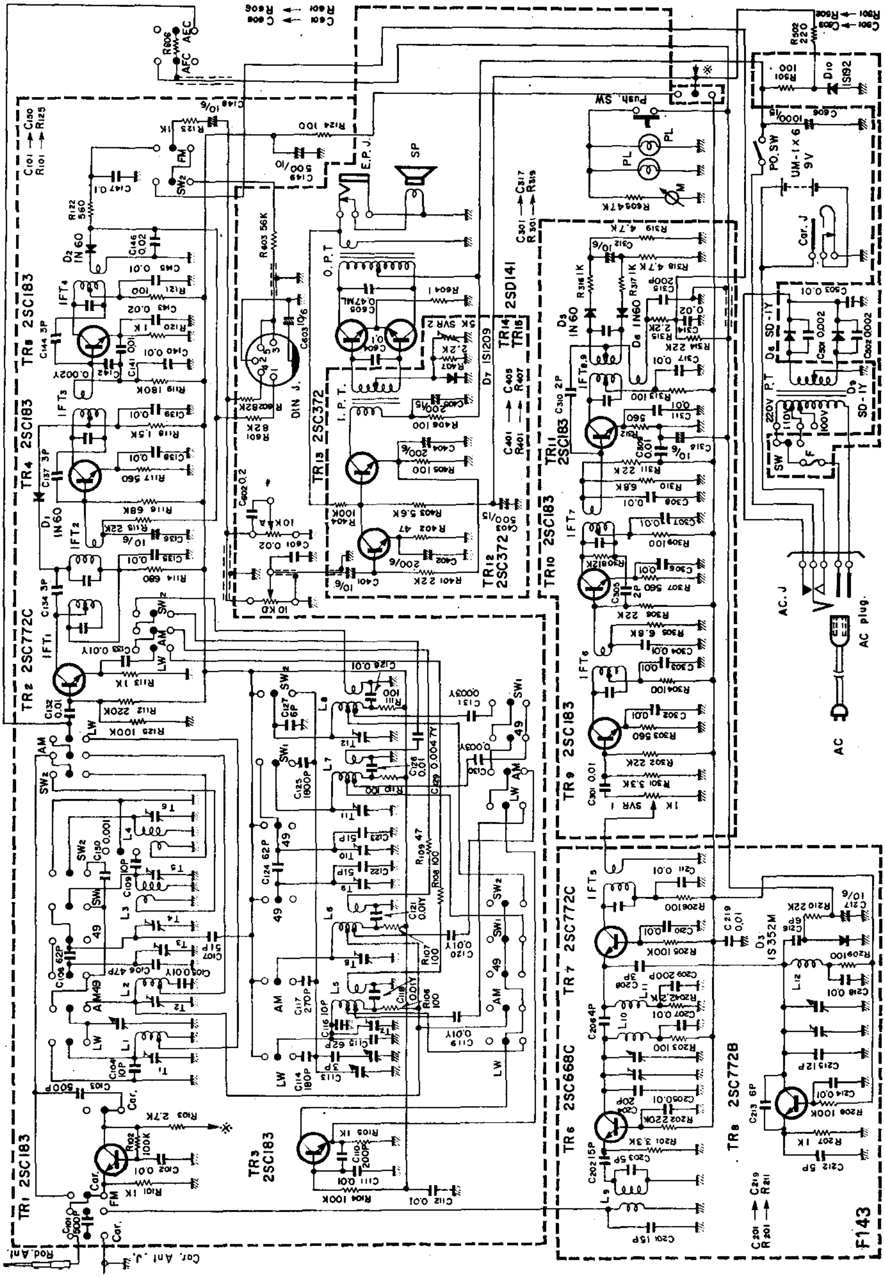
C.R.T. Removal: With chassis removed from its hinges, unscrew two vertical cabinet struts to provide tube removal clearance. Unhook one end of C.R.T. earthing spring, then see 1400 Series information in the 1968–69 volume. Note static discharge components fixed under top left-hand tube fixing nut.

Note: When refitting assemblies ensure that all bonding strips are correctly connected and that static discharge resistor and capacitor are repositioned between C.R.T. rim and earth.

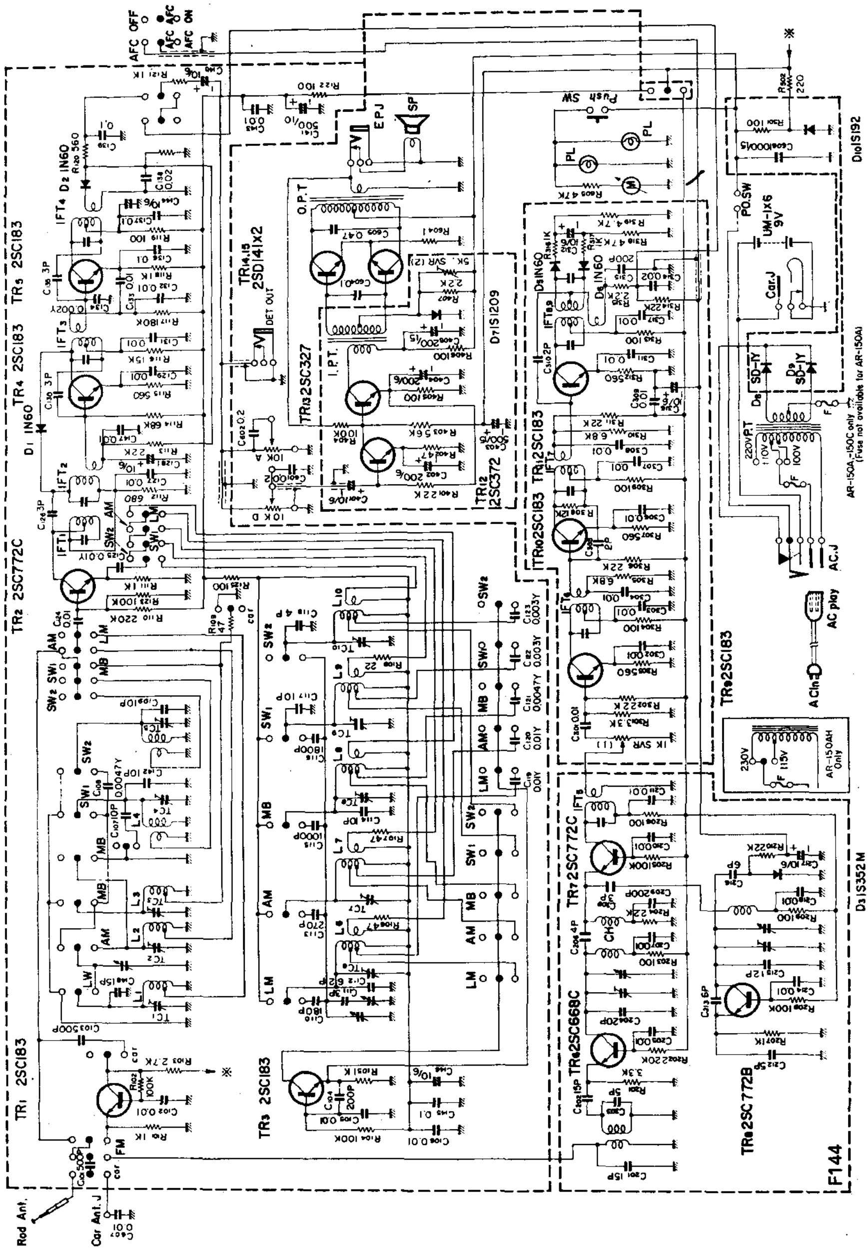
RADIO SERVICING

ACKNOWLEDGEMENTS

Aiwa Co. Ltd.
Alba (Radio & Television) Ltd.
British Radio Corporation Ltd.
Combined Electronic Services Ltd.
C.R.T.S. Ltd.
Daltrade Ltd.
Dansette Products Ltd.
Decca Ltd.
Denham & Morley Ltd.
Dynatron Radio Ltd.
Eddystone Radio Ltd.
Hacker Radio Ltd.
Halroy Products Ltd.
Klinger Controls Ltd.
Monogram Electric Co.
Philco International Ltd.
Radio & Allied (Holdings) Ltd.
Radiomobile Ltd.
Rank Bush Murphy Ltd.
Roberts Radio Co. Ltd.
R.T.S. Ltd.
Sanyo Service & Sales Ltd.
Sharp Sales & Service
Van Der Molen, H.M.



(F143) Circuit Diagram—Model AR-150 (*See page 396*)



(F144) Circuit Diagram—Models AR-150A, AR-150AH and AR-150C (*See overleaf*)

AIWA Models AR-150, AR-150A, AR-150AH and AR-150C

General Description: Portable radio receivers with 15 transistors. Maximum power output, 4 W at 9 V and 6·5 W at 12 V. Power supply, 9 V (six 1·5 cells) or 220/240 V 50 Hz.

Frequency Ranges: L.W.: 150–350 kHz. M.W.: 525–1,650 kHz. M.B.: 1·5–4 MHz. S.W.1: 3·9–10 MHz. S.W.2: 10–26 MHz. F.M.: 88–108 MHz.

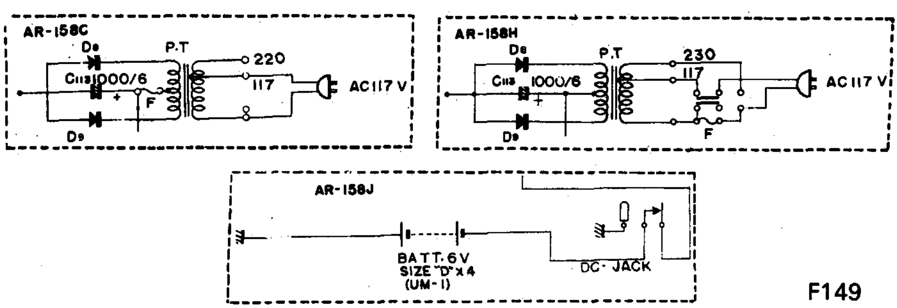
Circuits: The diagrams show the differences in circuitry between the AR-150 and the other models. The circuit diagrams are shown on pages 394 and 395.

AIWA Models AR-158, AR-158C, AR-158H and AR-158J

General Description: Portable radio receivers with a maximum output power of 1·2 W. Power supply, D.C., 6 V (4 × 1·5 V), or 220/240 V 50 Hz.

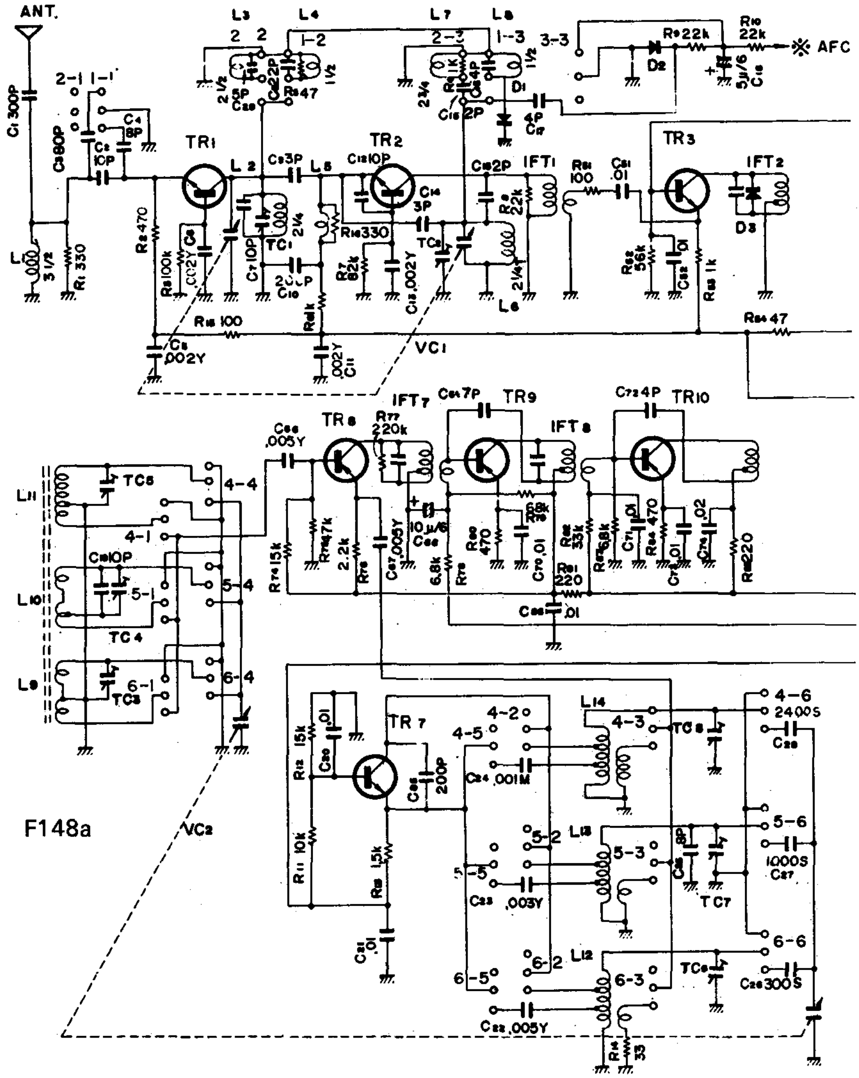
Frequency Ranges: M.W.: 525–1650 kHz. M.B.: 1·6–4 MHz. S.W.: 4–12 MHz. F.M.: 88–108 M–z. V.H.1: 110–136 MHz. V.H.2: 148–174 MHz.

Transistors: TR1 (2SC668), TR2 (2SC394), TR3 (2SC380), TR4 (2SC380), TR5 (2SC380), TR6 (2SC380), TR7 (2SC380), TR8 (2SC380), TR9 (2SA49), TR10 (2SA53), TR11 (2SB54), TR12 (2SB56), TR13 (2SB33) and TR14 (2SB33).

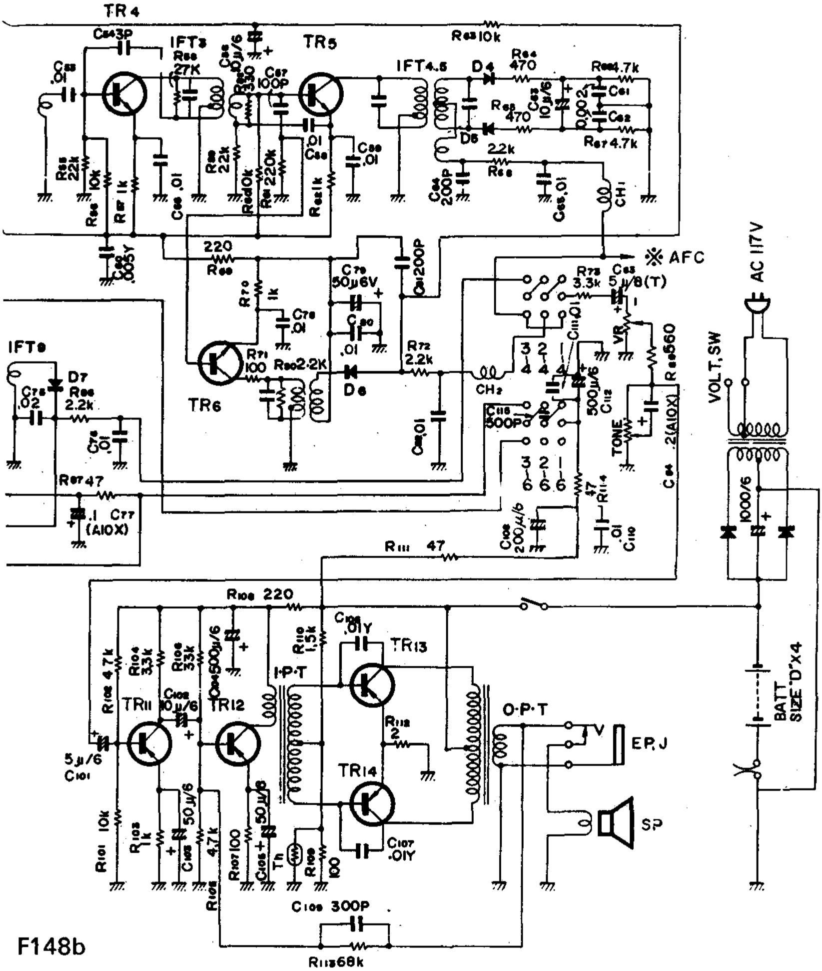


(F149) Circuit Differences—Models AR-158C, AR-158H and AR-158J

Diodes: D1–D6 (IN60), D8 and D9 (SD1Y).
Thermistor: TH (19D26A).



(F148a) Circuit Diagram—Model AR-158 (Part)



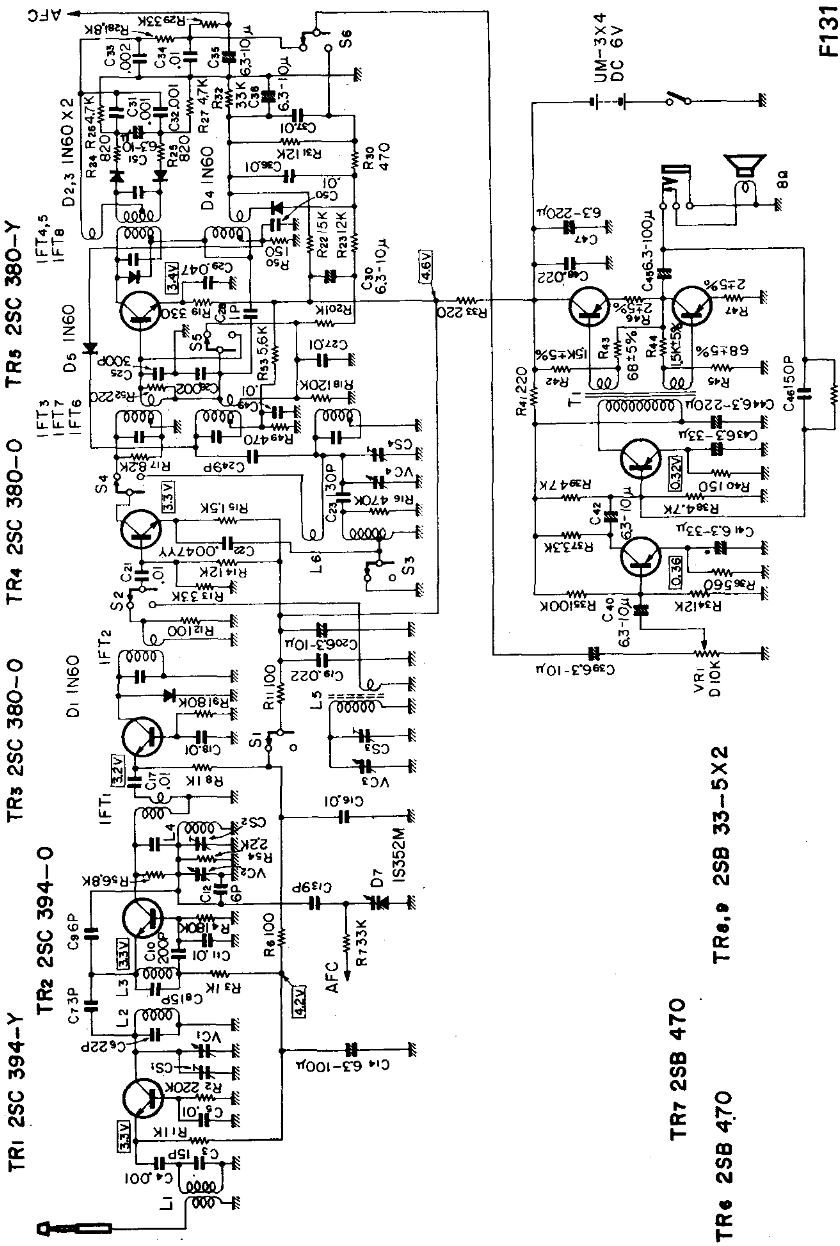
F148b

(F148b) Circuit Diagram—Model AR-158 (Continued)

AIWA Models AR-160 and AR-160E

General Description: Nine-transistor A.M./F.M. portable radio receiver with a maximum output power of 500 mW. Power supply, D.C., 6 V, 4 × 1·5 V.

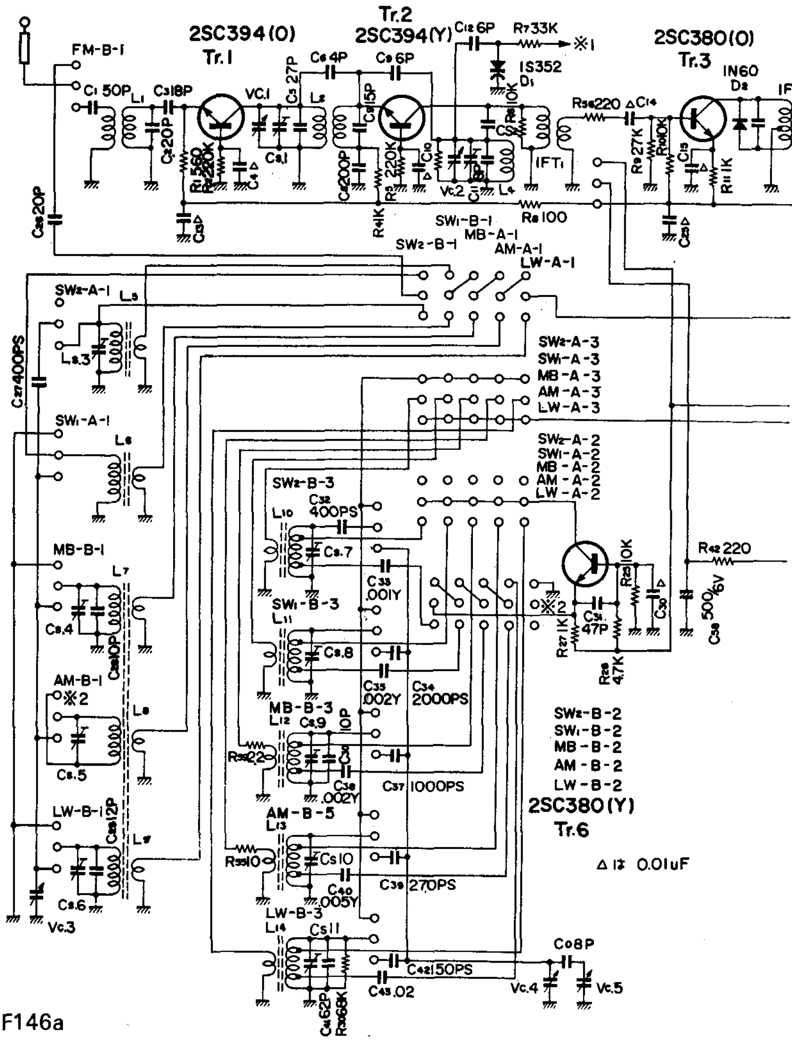
Frequency Ranges: A.M.: 525–1650 kHz. F.M.: 88–108 MHz.



(F131) Circuit Diagram—Models AR-160 and AR-160E

AIWA Model AR-159H

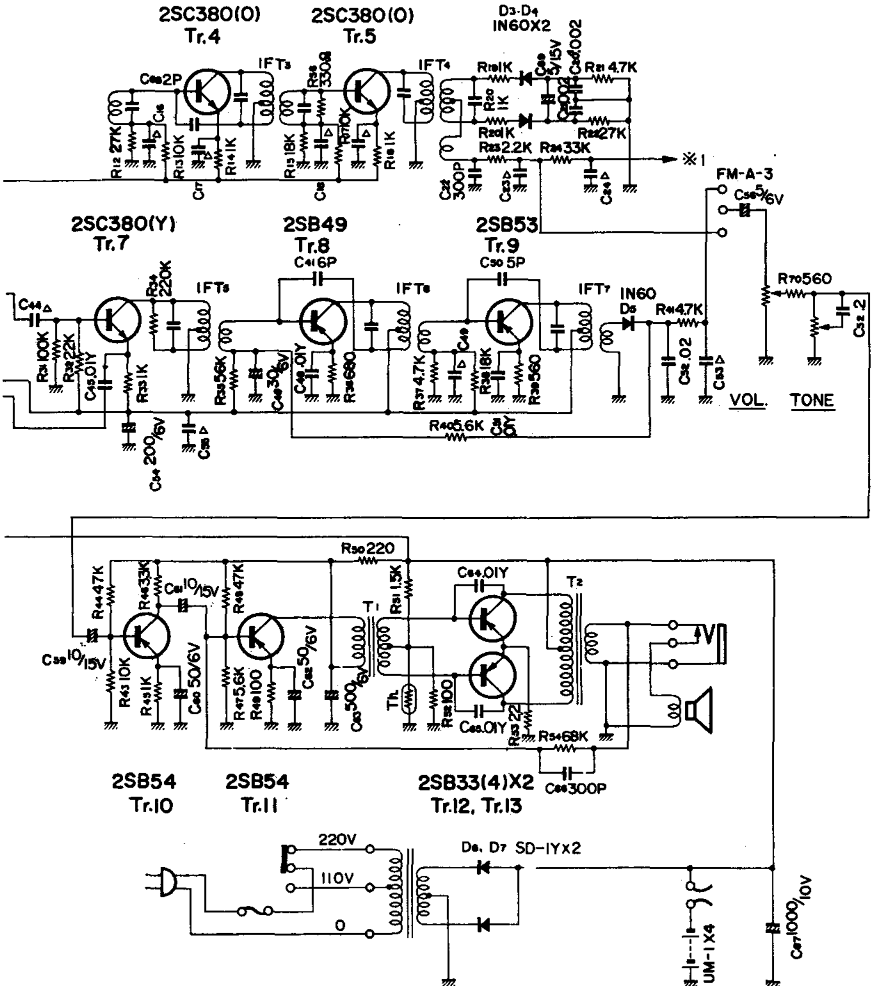
General Description: Portable radio receiver with a maximum output power of 1·2W. Power supply, D.C., 6V (4 × 1·5V), or A.C. 220/240V 50Hz.



F146a

(F146a) Circuit Diagram—Model AR-159H (Part)

Frequency Ranges: L.W.: 150–350kHz. M.W.: 525–1650kHz. M.B.: 1·6–4MHz. S.W.1: 4–12MHz. S.W.2: 12–26MHz. F.M. 88–108MHz.



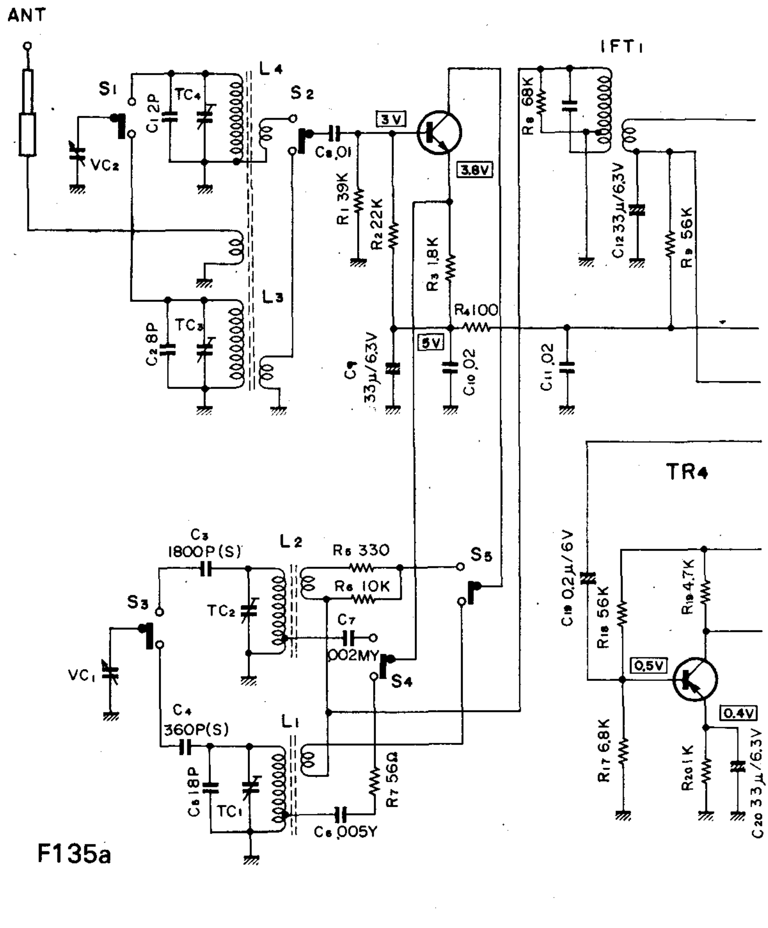
F146b

(F146b) Circuit Diagram—Model AR-159H (Continued)

AIWA Models AR-734 and AR-734A

General Description: Seven-transistor portable radio receiver with a maximum output power of 500mW. Power supply, D.C., 6V (4 × 1·5V).

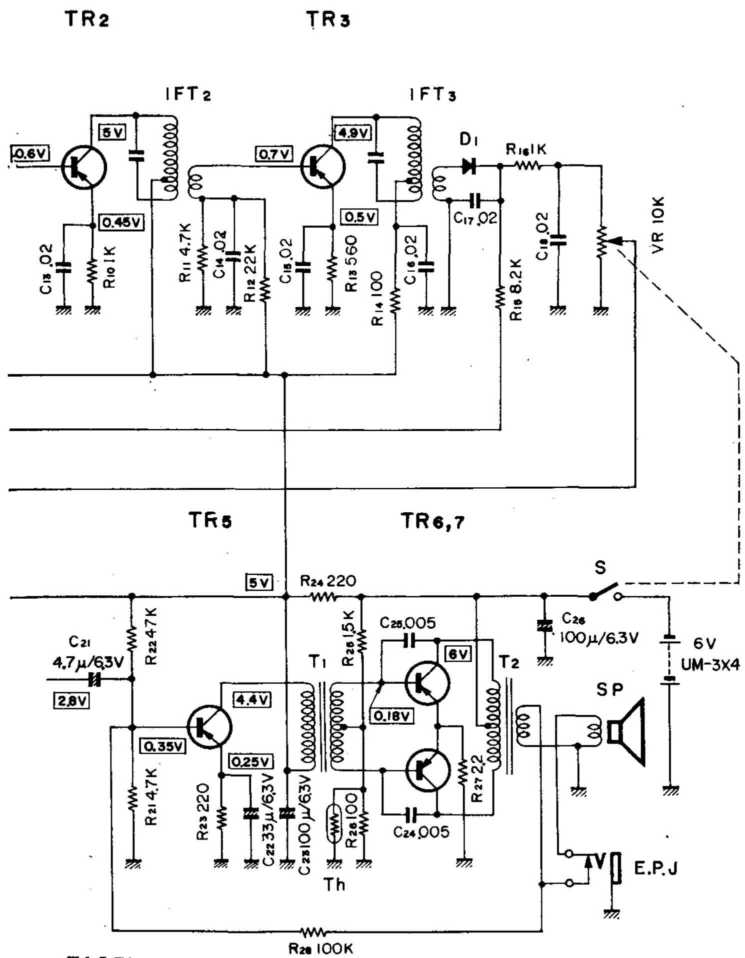
Frequency Ranges: M.W.: 525–1650kHz. S.W.: 3·2–12MHz (AR-734). S.W.:5–19MHz (AR-734A).



F135a

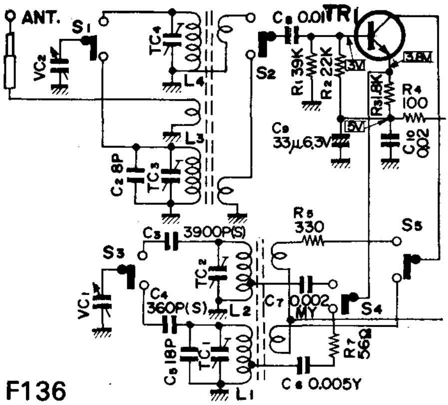
(F135a) Circuit Diagram—Model AR-734 (Part)

Transistors: TR1 (2SC380), TR2 (2SA466), TR3 (2SA466), TR4 (2SB422), TR5 (2SB422), TR6 (2SB423) and TR7 (2SB423).
Diode: D1 (M8489).
Thermistor: TH (19D-26A).



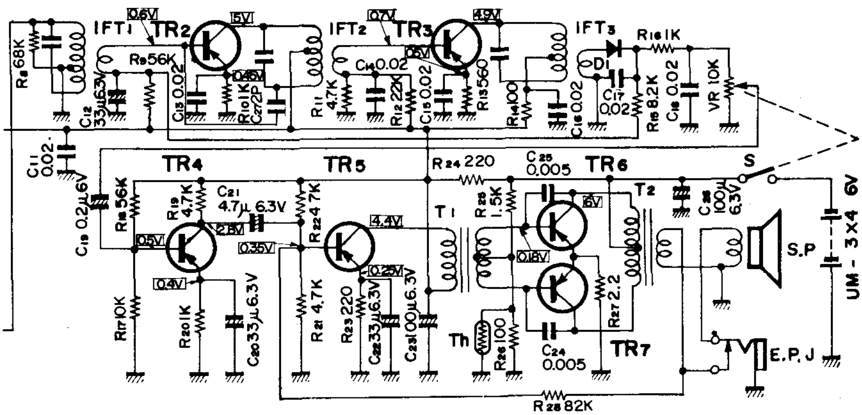
F135b

(F135b) Circuit Diagram—Model AR-734 (Continued)



The right-hand portion of this circuit diagram is continued below.

F136



(F136) Circuit Diagram—Model AR-734A

AIWA Model AR-614

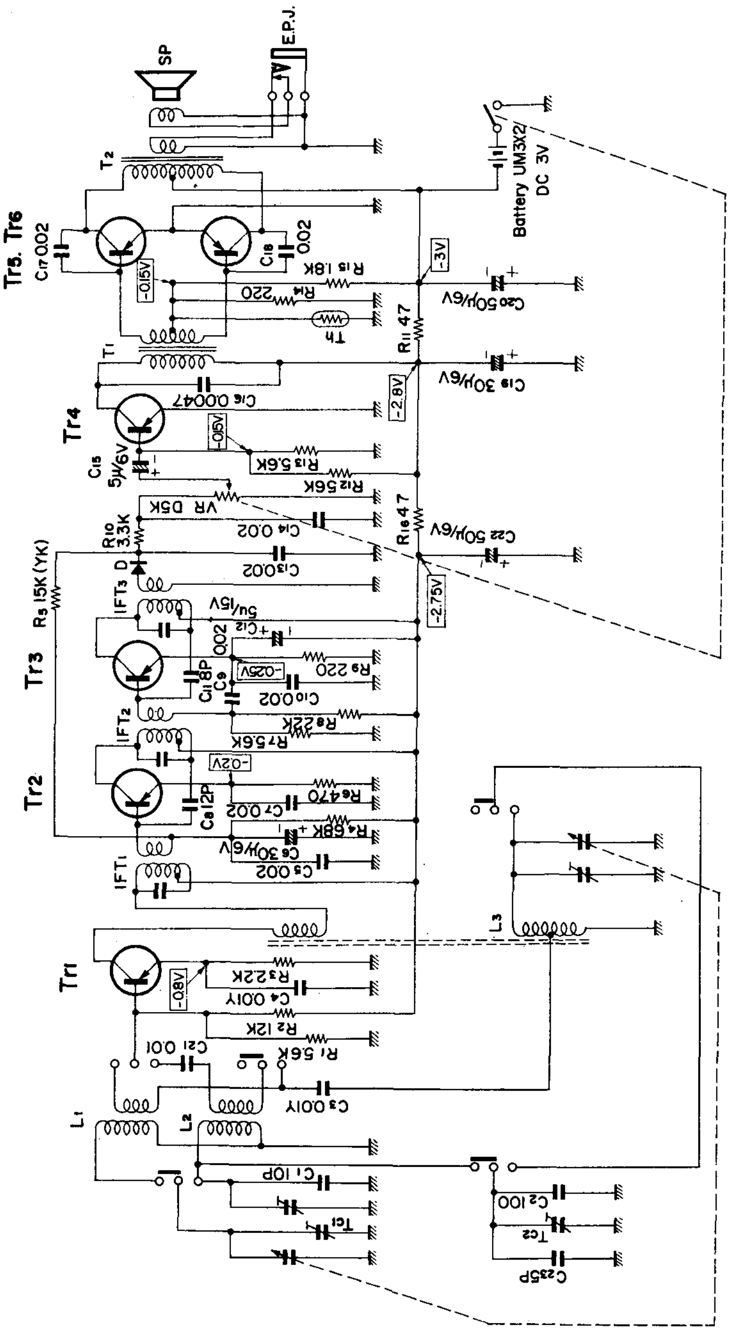
General Description: Six-transistor portable radio receiver with a maximum output power of 180mW. Power supply, D.C., 3 V, 2 × 1·5 V.

Frequency Ranges: M.W.: 525–1650kHz. L.W.: 150–260kHz.

Transistors: TR1 (2SA93), TR2 (2SA49), TR3 (2SA53), TR4 (2SB470), TR5 (2SB169) and TR6 (2SB169).

Diode: D (1N60)

Thermistor: TH (22D27A).



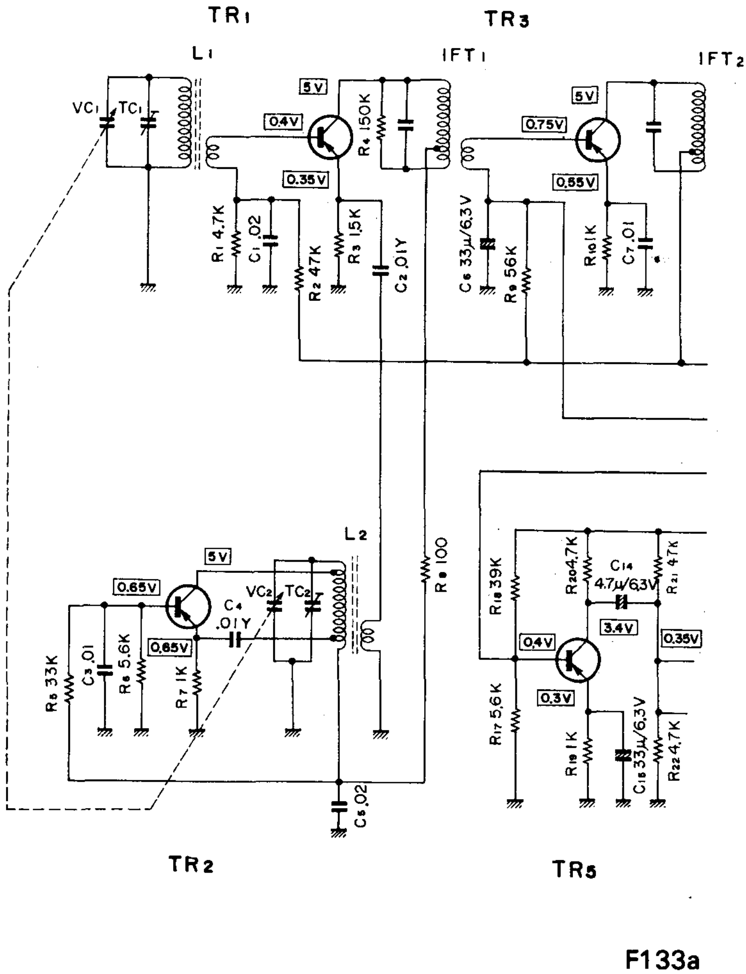
Switch Connection
· AM
Common
LW

F137

(F137) Circuit Diagram—Model AR-614

AIWA Model AR-866

General Description: Eight-transistor portable radio receiver with a maximum power output of 500mW. Power supply, D.C., 6V, 4 × 1·5V.



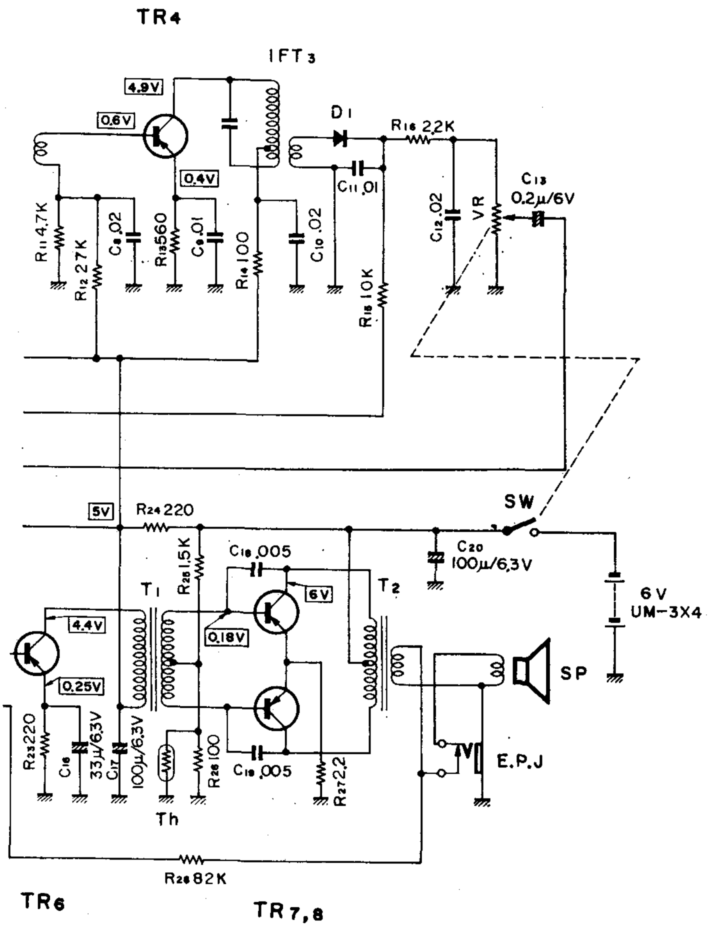
(F133a) Circuit Diagram—Model AR-866 (Part)

Frequency Ranges: M.W. (only): 525–1650kHz.

Transistors: TR1 (2SA466), TR2 (2SA466), TR3 (2SA466), TR4 (2SA466), TR5 (2SB422), TR6 (2SB422), TR7 (2SB423) and TR8 (2SB423).

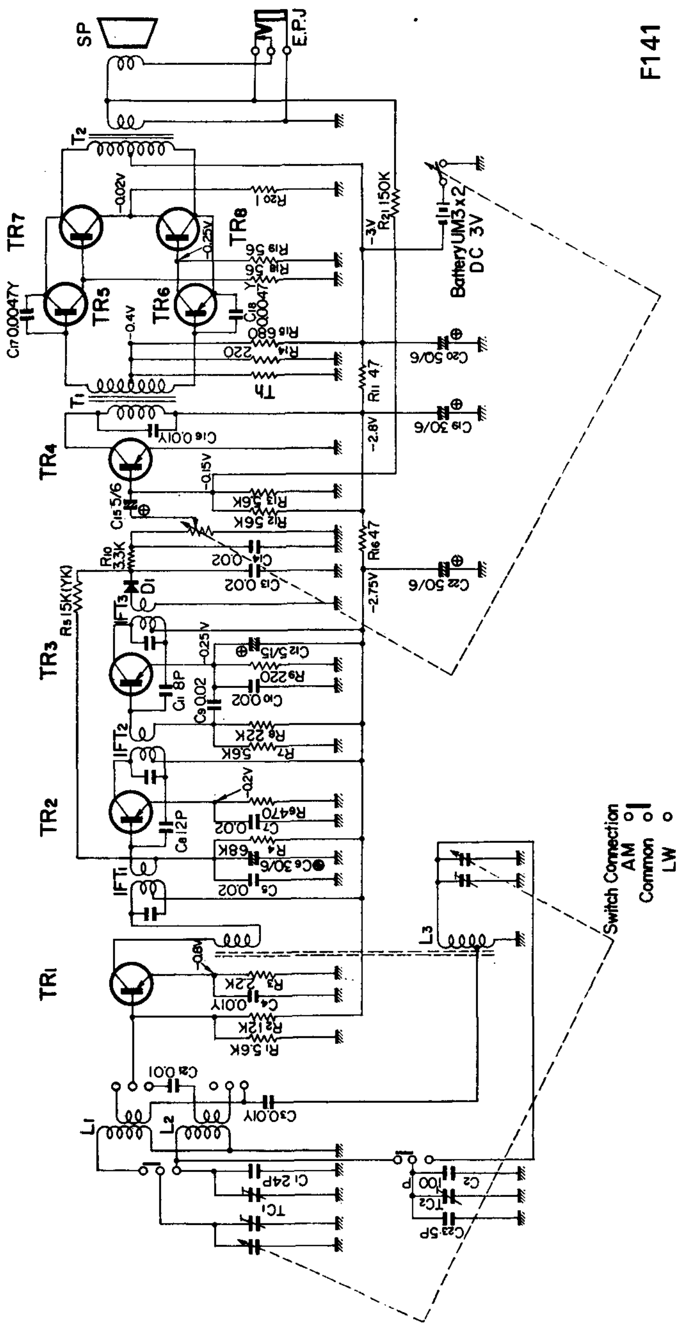
Diode: DI (M8489).

Thermistor: TH (19D26A).

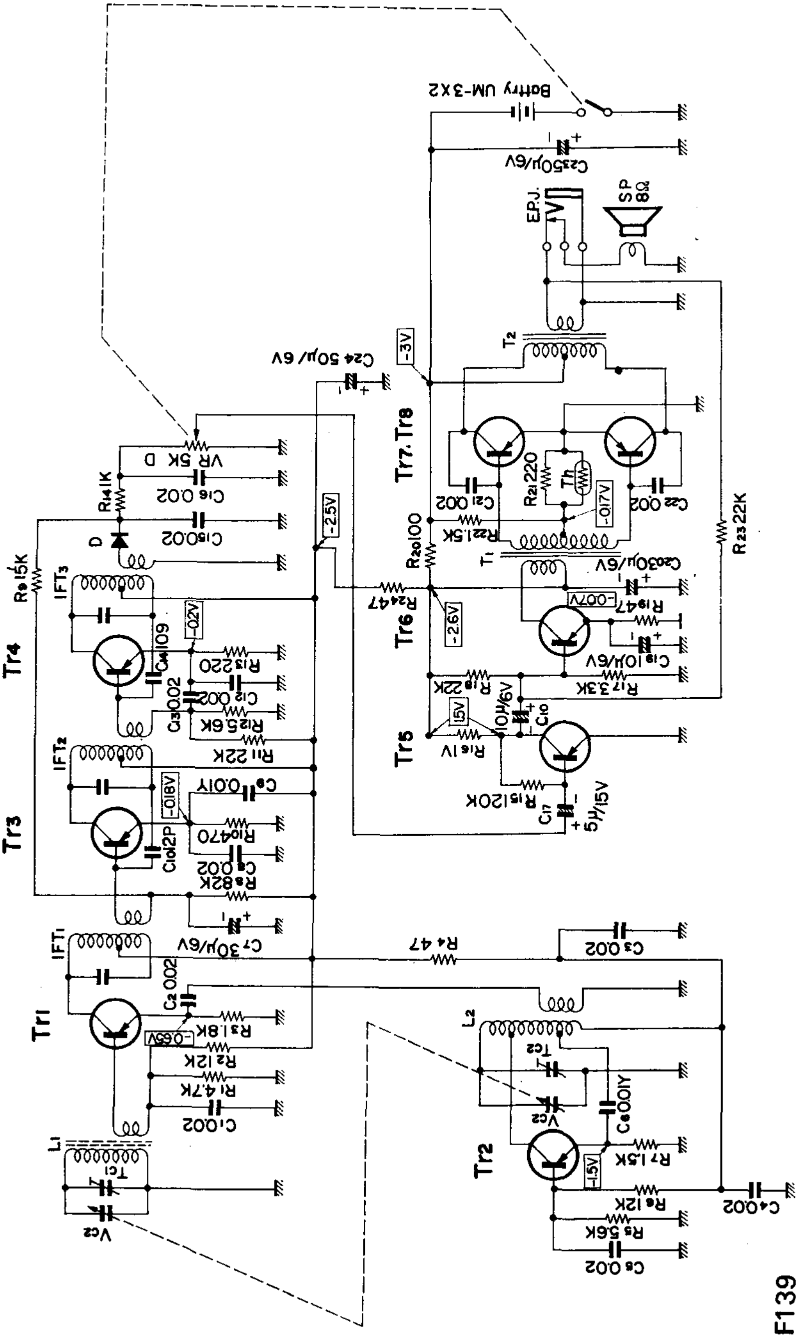


F133b

(F133b) Circuit Diagram—Model AR-866 (Continued)



(F141) Circuit Diagram—Model AR-823 *(See page 410)*



F139

(F139) Circuit Diagram—Model AR-865 *(See page 410)*

AIWA Model AR-823

General Description: Eight-transistor portable radio receiver with a maximum power output of 180mW. Power supply, D.C., 3V, 2 × 1·5V.

Frequency Ranges: M.W.: 525–1650kHz. L.W.:150–260kHz.

Transistors: TR1 (2SA469), TR2 (2SA49), TR3 (2SA53), TR4 (2SB470) and TR5, TR6, TR7, TR8 (2SB169).

Diode: DI (IN60).

Thermistor: TH (22D27A).

Circuit Diagram: See page 408.

AIWA Model AR-865

General Description: Eight-transistor portable radio receiver with a maximum output power of 180mW. Power supply, D.C., 3V, 2 × 1·5V.

Frequency Ranges: M.W. (only): 525–1650kHz.

Transistors: TR1 (2SA201), TR2 (2SA201), TR3 (2SA202), TR4 (2SA203), TR5 (2SB270), TR6 (2SB270), TR7 (2SB187) and TR8 (2SB187).

Diode: D (IS426).

Thermistor: TH (22D-27A).

Circuit Diagram: See page 409.

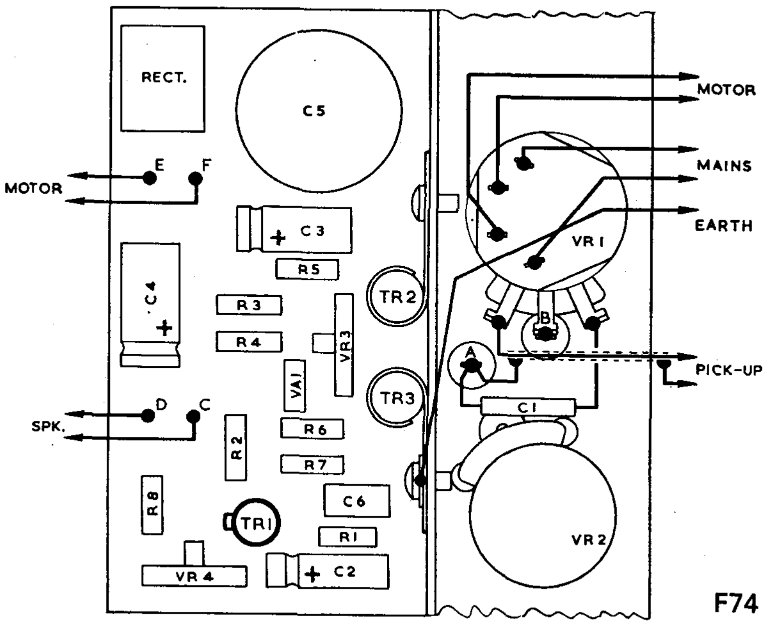
ALBA Model RP6

General Description: Three-transistor amplifier with push–pull output. Circuit features: tone control, negative feedback and direct coupling between driver and output stage.

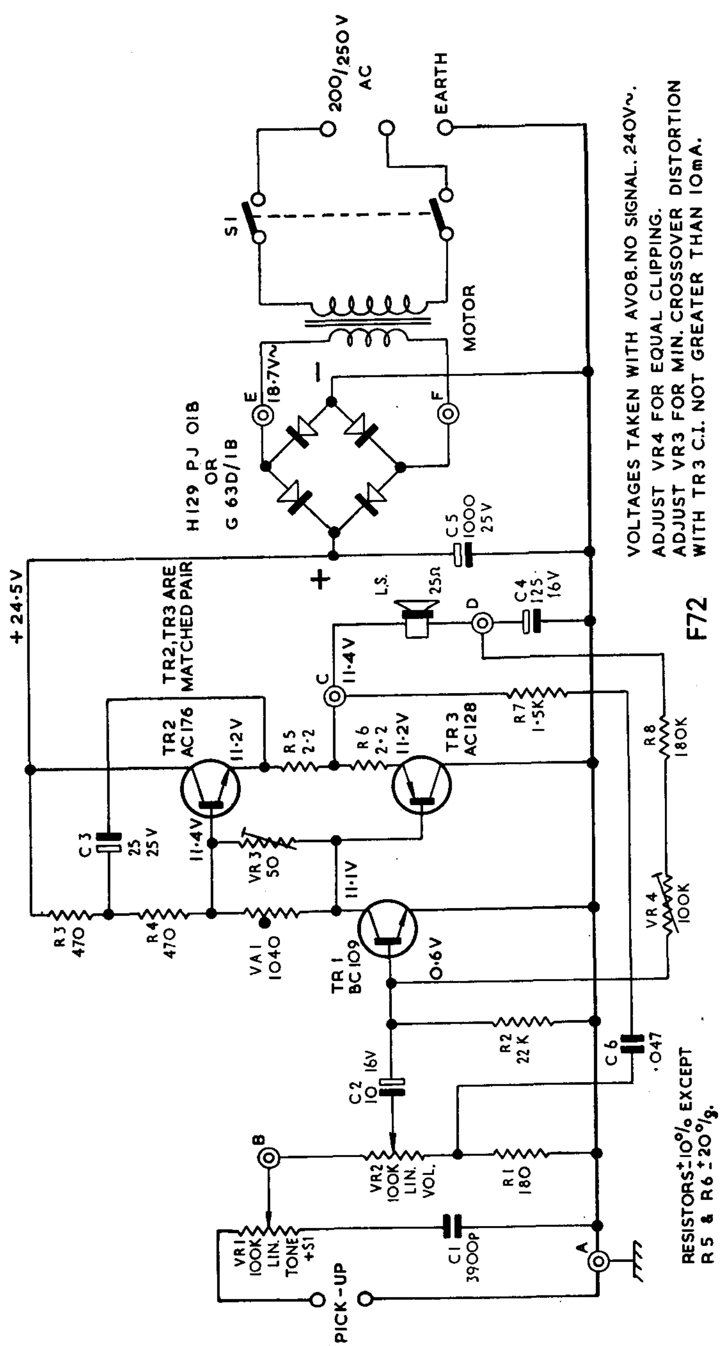
Sensitivity: With pick-up disconnected and generator applied via 1000 pF (volume at maximum): 1·4 V (tone at minimum) for 5 V output and 1·1 V (tone at maximum) for 5 V output.

Dismantling: Remove loudspeaker cover, pull off knobs, remove two 4BA nuts and lift out chassis.

Replacement: Reassemble in reverse order, taking care to avoid damage to components when replacing and tightening nuts.



(F74) Component Locations—Model RP6

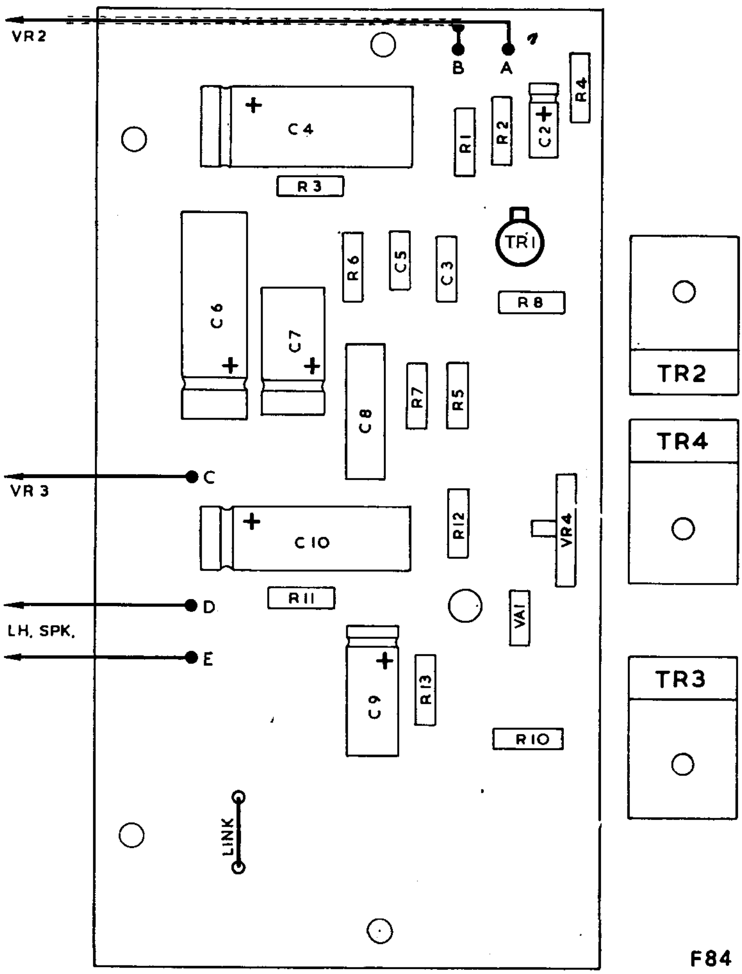


(F72) CIRCUIT DIAGRAM—MODEL RP6

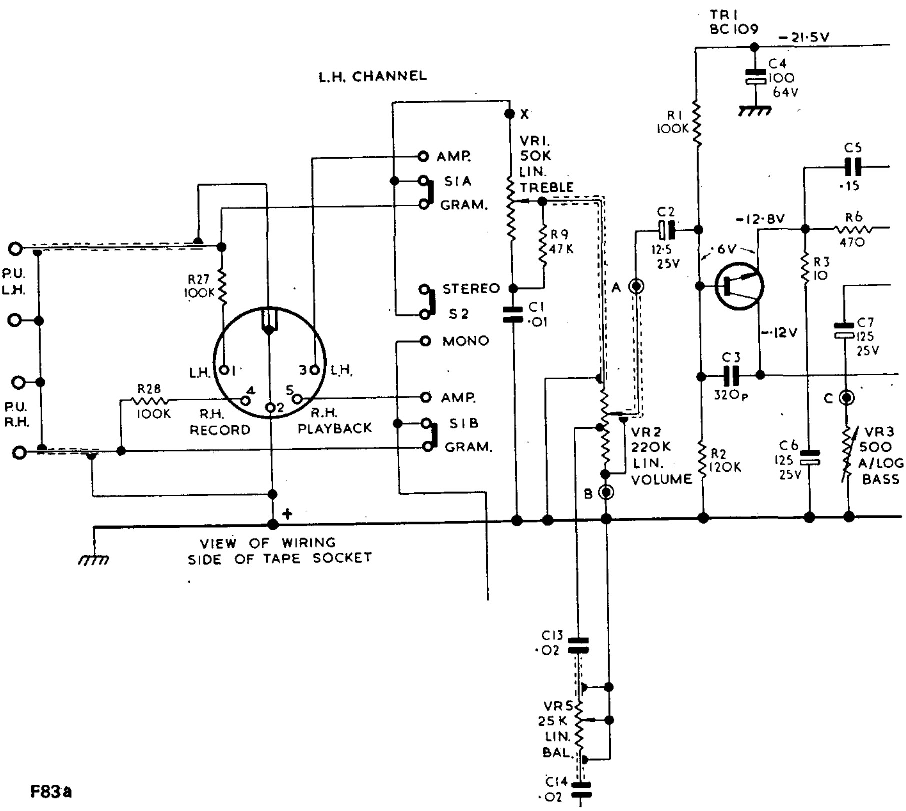
ALBA — Models RP7 and RP7A

General Description: Four-transistor-per-channel, mains-operated, stereophonic record player. Power output 6·4W.

Dismantling RP7: Pull off four control knobs. Remove bottom cover. Remove two 4BA nuts fixing bottom of chassis to partition. Lift out chassis. When replacing chassis make sure location studs on chassis enter holes in control panel.



(F84) Component Lay-out—Models RP7 and RP7A



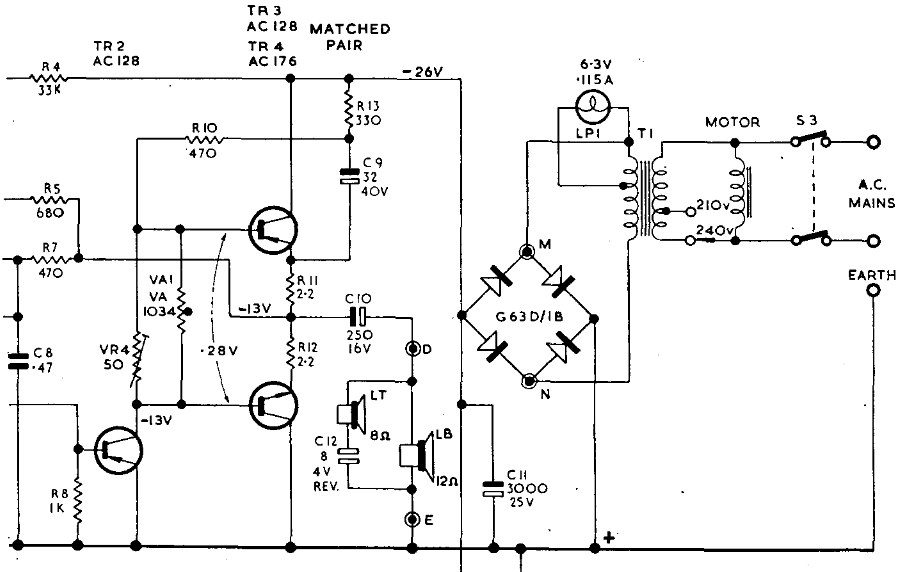
F83a

(F83a) Circuit Diagram—Models RP7 and RP7A (Part)

Dismantling RP7A: Pull off knobs. Remove loudspeaker cover. Remove four screws holding motor board, and lift out board. Remove pilot lamp bracket and balance control bracket. Remove two 4BA nuts fixing control chassis and two nuts fixing chassis extension. Lift out chassis. Replace chassis so that knobs are concentric to grill printing.

Pre-set Controls: Adjust VR4 and VR9 for minimum crossover distortion with TR4 and TR8 Ic not greater than 10mA.

Sensitivity: With P.U. disconnected and generator applied via 1000pF to either channel. Volume at maximum. For 3·5 volts rms at 1kHz across 12 Ω resistor, load (1 W) in either channel. With VR1/6 and VR3/8 at minimum —490mV. With VR1/6 and VR3/8 at maximum—200mV.



F83b

CCT. AS DRAWN IS FOR RP7.
FOR RP7A :-
LT, RT, C12 & C25 ARE DELETED.
S3. IS ON VR2, 7.
T1 INPUT NOT ADJUSTABLE.
INPUT TO 240V TAP.
VR 3 & 8 ARE 2K. A/LOG.
C7 & 21 ARE 32. 40V.
INPUT CCT. AS SHOWN ON LEFT.
E & D GO TO LH. SPK. VIA JACK SOCKET.

ON LATER MODELS C2 & C16 ARE ·22μ

RESISTORS ±10% EXCEPT
R1, R2, R14, & R15 ±5%
R9, R11, R12, R22, R24, & R25 ±20%

VOLTAGES MEASURED WITH AVO. 8.
240V MAINS, NO SIGNAL INPUT.

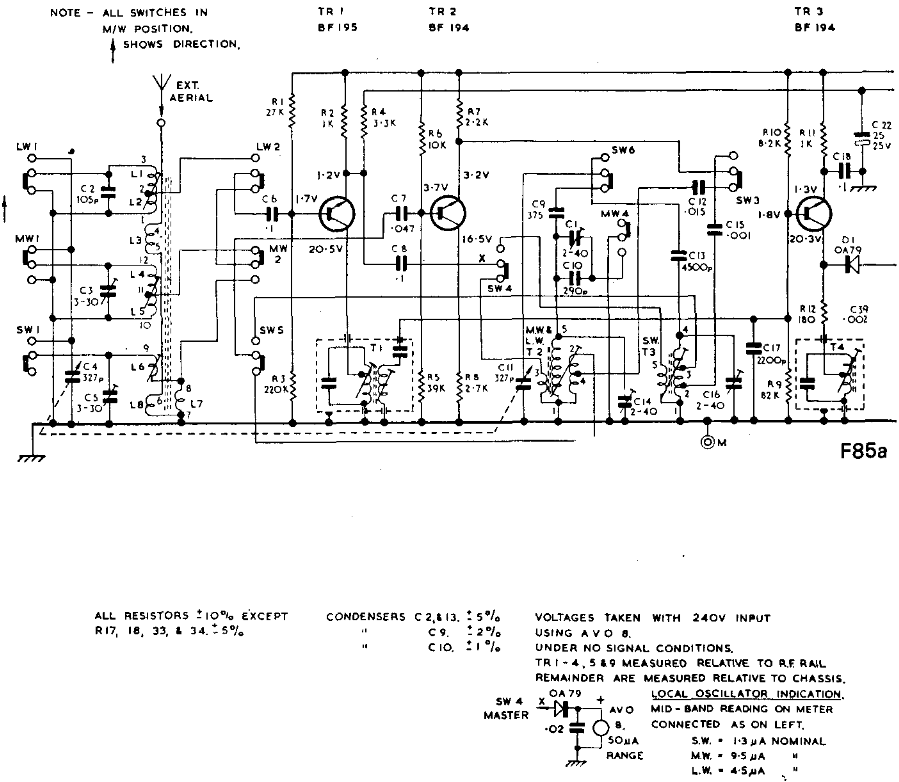
(F83b) Circuit Diagram—Models RP7 and RP7A (Continued)

ALBA Model 46

General Description: Twelve-transistor, three-waveband radio receiver with an audio stereophonic amplifier. I.F. 470kHz.

Wavebands: L.W.: 1035–1900 metres. M.W.: 183–577 metres. S.W.: 5·8–19MHz.

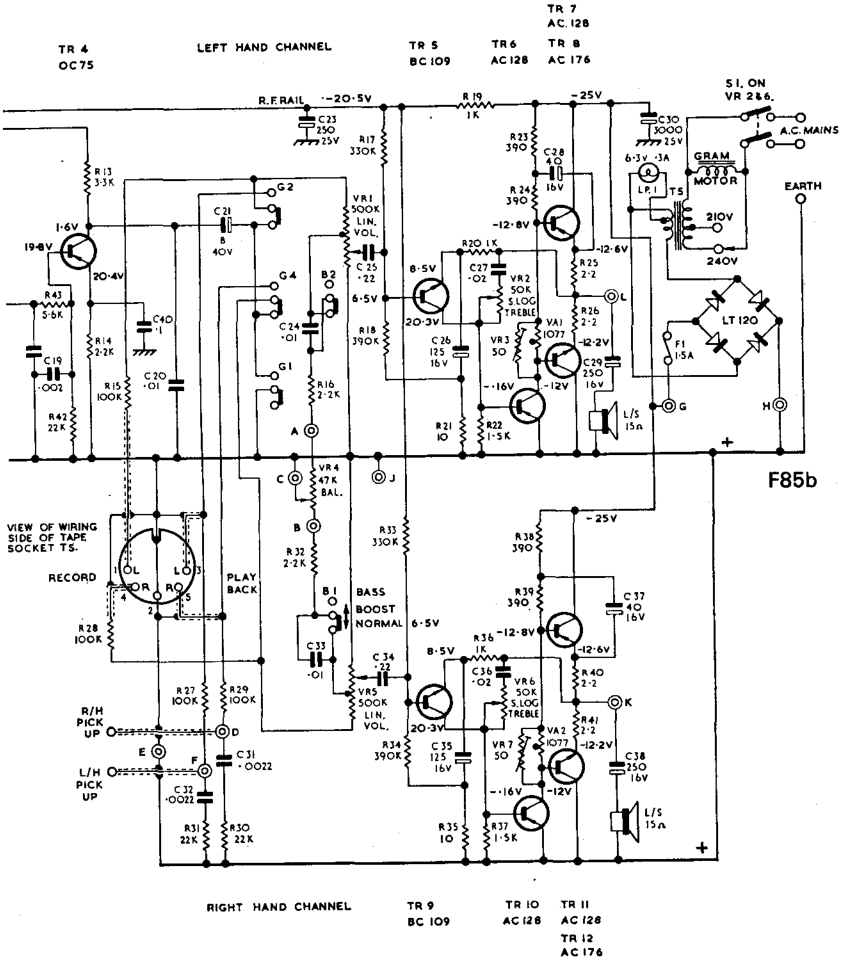
Chassis Removal: Pull off knobs, remove three 4BA nuts (one at each end of chassis and one at top fixing strip), note washer between strip and wood block, lift out chassis.



(F85a) CIRCUIT DIAGRAM—MODEL 46 (PART)

Sensitivity: For 50mW output, with volume and treble at maximum, and Bass button out. 470 kHz via 0·1μF to: TR1 base (7μV), TR3 base (350μV) and DI (70mV). 1 MHz via 0·1μF to: TR1 base (8μV). 6MHz via 0.1μF to: TR1 base (9μV). 1kHz via 0·1μF to: TR5 base (15·5mV) and TR9 base (15·5mV).

Alignment (I.F.): Set volume to maximum. Inject 470kHz via 0·1μF to TR1 base, and trim T4 and T1 for maximum output. Use 30 per cent mod. and keep signal input level low to prevent A.G.C. action.

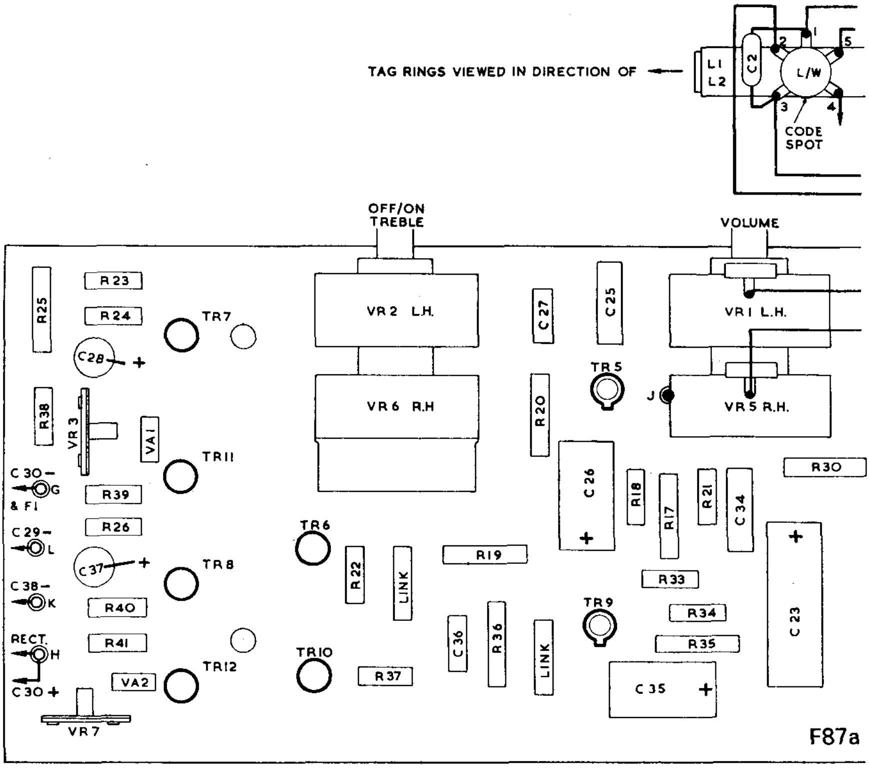


(F85b) Circuit Diagram—Model 46 (Continued)

Alignment (M.W.): Inject signal into aerial socket. Tune to 600 kHz. Inject 600 kHz and adjust T2 and L4 for maximum output. Tune to 1500 kHz. Inject 1500 kHz and adjust C14 and C3 for maximum output.

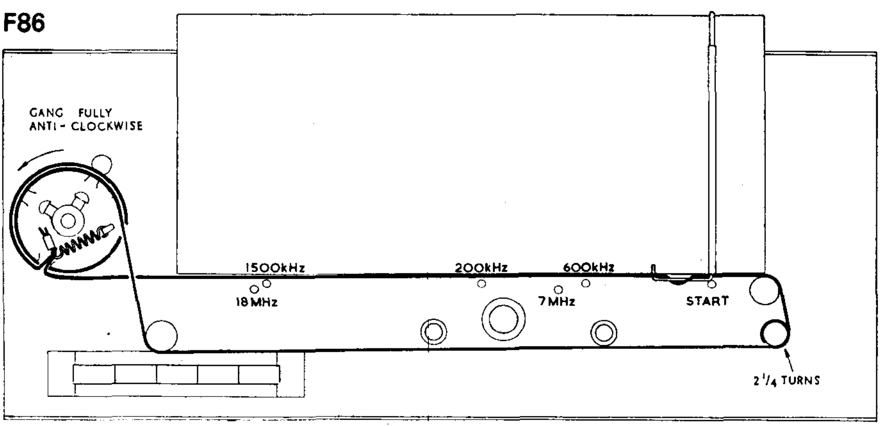
Alignment (L.W.): Inject signal into aerial socket. Tune to 200 kHz. Inject 200 kHz and adjust C1 and L1 for maximum output.

Alignment (S.W.): Inject signal into aerial socket. Tune to 7 MHz. Inject 7 MHz and adjust T3 and L6 for maximum output. Adjust L6 by opening or

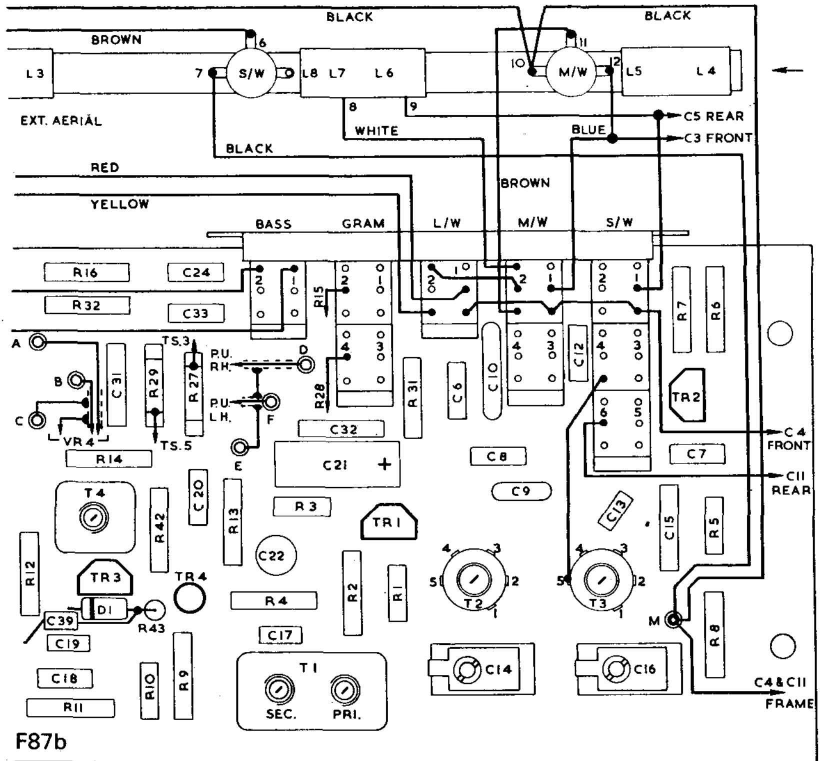


(F87a) Component Locations—Model 46 (Part)

F86



(F86) Drive Cord—Model 46



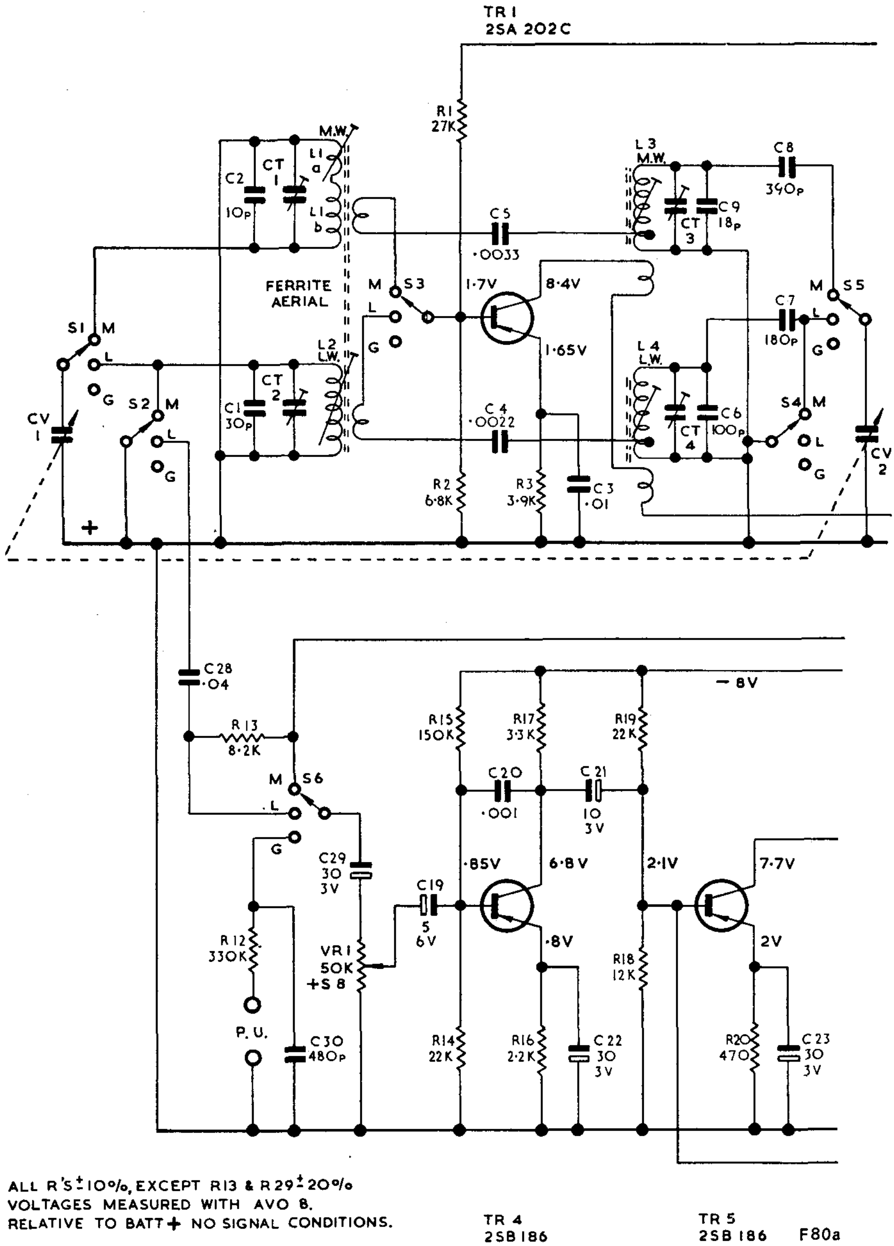
(F87b) COMPONENT LOCATIONS—MODEL 46 (CONTINUED)

closing winding. Tune to 18 MHz. Inject 18 MHz and adjust C16 and C5 for maximum output.

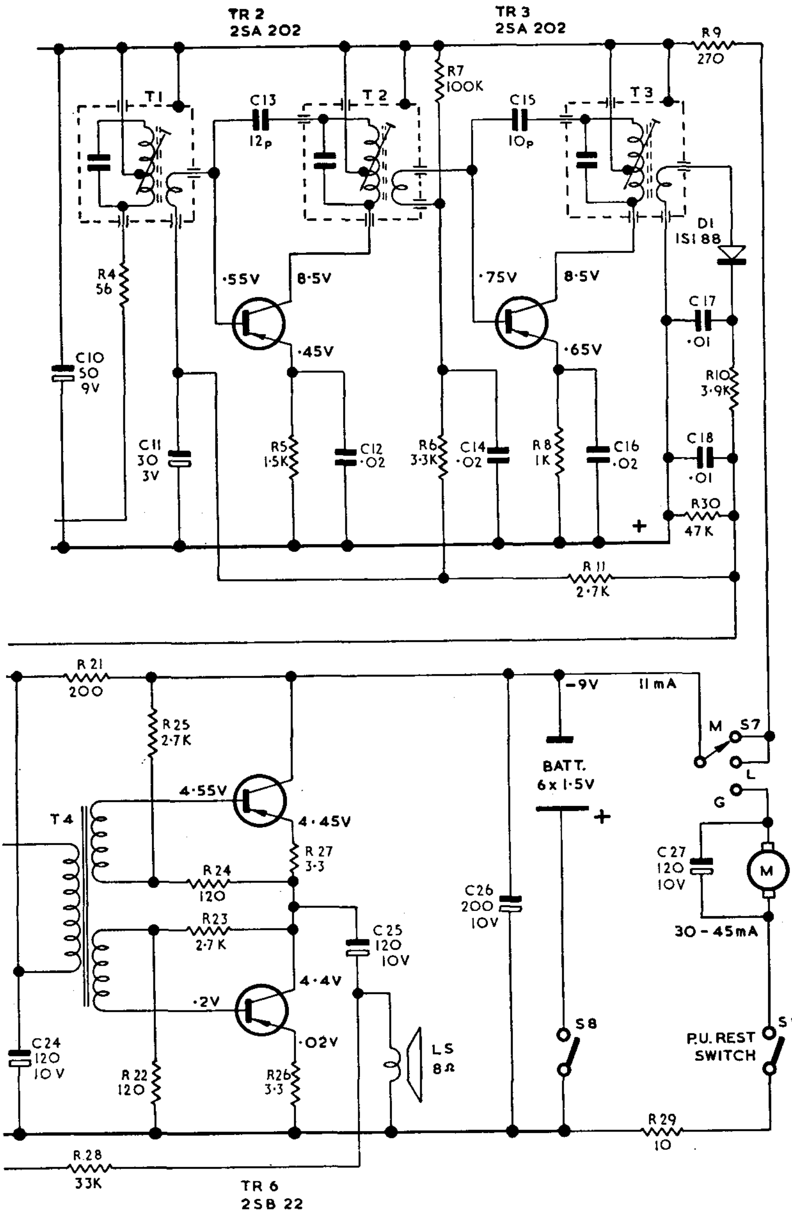
Audio Adjustment: Adjust VR3/VR7 for minimum crossover distortion. The collector current of TR8 and TR12 should not exceed 10 mA.

ALBA — Model 3000

General Description: Seven-transistor, two-waveband and two-speed-player radiogram. Wavebands: M.W.: 178–580 m.; L.W.: 820–2050 m. Power output for 10 per cent distortion 400 mW, maximum 600 mW. Current consumption 11 mA no-signal and 140 mA maximum.



(F80a) CIRCUIT DIAGRAM—MODEL 3000 (PART)

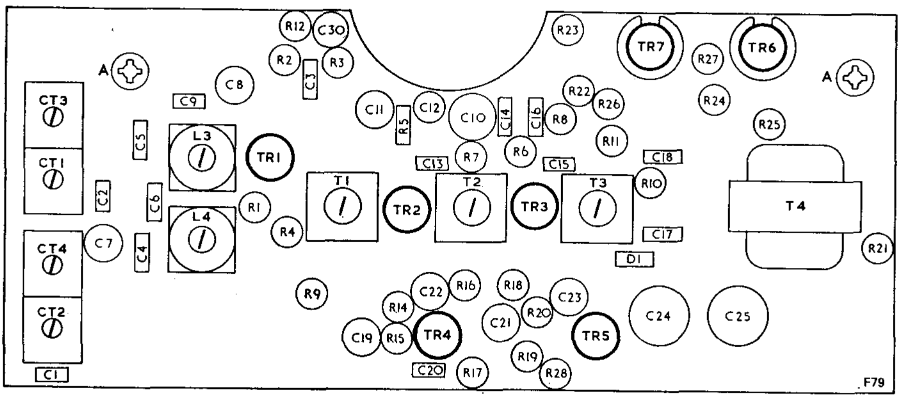


F80b

(F80b) Circuit Diagram—Model 3000 (Continued)

Dismantling: Pull off W/Change knob. Remove two self-tapping screws in side opposite to handle and two machine screws in recesses in bottom. Bottom of cabinet can then be lifted off.

To Remove Chassis: Remove two machine screws on printed panel and four self-tapping screws on control plate. Chassis can then be lifted out, to the extent of the connecting leads.



(F79) Component Lay-out—Model 3000

Alignment: Set volume control to maximum. Keep generator input low to prevent A.G.C. action.

Stage	*Generator*	*Frequency*	*Set pointer*	*Adjust for maximum output*
I.F.T.S.	Connect to radiation loop	470kHz	550m	T3, T2, T1
L.W.	Connect to radiation loop	150kHz 300kHz	2000m 1000m	L4, L2 CT4, CT2
M.W.	Connect to radiation loop	600kHz 1500kHz	500m 200m	L3, L1a CT3, CT1

Repeat each operation for optimum results.

Sensitivity: For 50mW output (tuned to 550 m.) 470kHz via 0.001 μF to: TR1 base 14 μV, TR2 base 90 μV, TR3 base 2.3mV, D1 23mV. 1MHz to TR1 base via 0·001 μF, 2 μV. Audio for 50mW output on GRAM 1kHz via 820pF to VR1 75mV. With P.U. disconnected.

BRC Semi-Conductor Replacement Guide

Purpose of Guide: The world-wide shortage of semi-conductor devices has resulted in the use of a wide range of types in BRC products. It has also meant that BRC service depots have been unable to maintain stocks of some types which have been used and have therefore had to supply alternatives which, although electrically similar, differ in shape and sometimes in the base connections.

This guide introduces a new approach to transistor classification with the object of simplifying the ordering of transistors and making it possible for dealers to hold useful stocks of replacement transistors and so reduce servicing delays.

Models Covered by Guide:

205STA	2338	3330	4316
206STA	2340	3334	4318
2028	2342	3338	4320
2030	2344	3340	4322
2032	2400	3344	4342
2038	2401	3348	4344
2040	2402	3352	4403
2236	2403	3354	6018 Sch.A
2322	3018	3356	6018 Sch.B
2324	3022	3400	6020
2326	3024	4018	6322
2332	3026	4024	6324
2336	3232	4028	6326
2337	3236	4218	6330

The New Classification: Replacement transistors and diodes for BRC audio products will, in future, be dispatched in individual envelopes labelled with a simple BRC classification number, e.g. RF1 or AF3 or D2, etc. Each classification number will therefore give an immediate recognition of the job for which it is intended. The semi-conductor packed in the envelope could be any one of several types, depending upon the supply situation. Base connection diagrams for all possible types will, however, be printed on the envelope.

For convenience, transistor location diagrams for recently manufactured audio products are given with each transistor and diode. Many classification numbers are common to a number of chassis. The same replacements can therefore be used in various models.

Similar diagrams to those given in this guide will in future be glued inside the cabinets of all BRC audio products, and service manuals will also in future quote classification numbers.

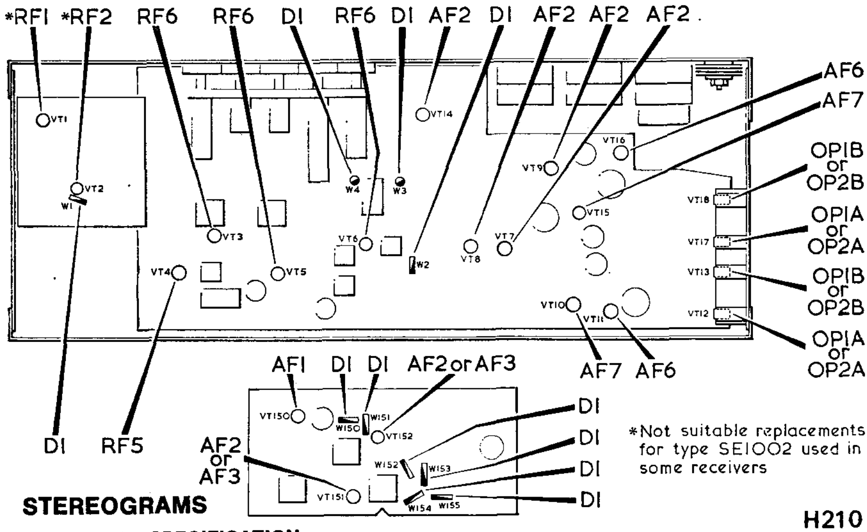
Many dealers already hold stocks of transistors under the manufacturers' type numbers and so that full advantage can be taken of the new classifications, the types which can be included under each classification number are also given in this guide.

Stereograms Standard Specification

(*a*) *Ferguson Models:* 3330, 3334, 3338, 3340, 3344, 3348, 3352, 3354 and 3356.
(*b*) *H.M.V. Models:* 2322, 2324, 2326, 2332, 2338, 2342 and 2344.
(*c*) *Marconiphone Models:* 4316, 4318, 4320, 4322, 4342 and 4344.
(*d*) *Ultra Models:* 6322, 6324, 6326 and 6330.

Special Note: Two types of output transistors have been used in these radiograms. Where a flat heatsink with each transistor secured by a screw is used, replacement types oP1A and oP1B are required. Types oP2A and oP2B can only be fitted to chassis using diecast heatsinks with circular recesses to house the transistors.

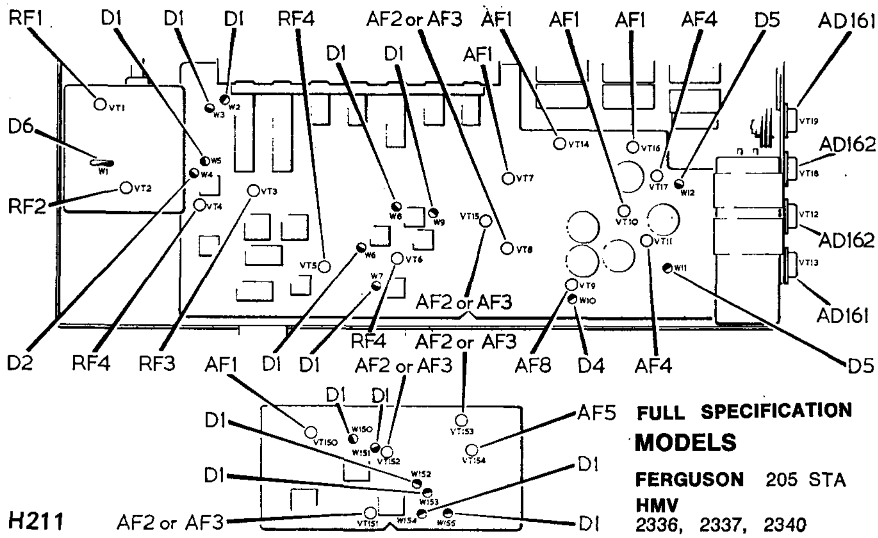
Bias stabilizing diodes have been used in the output of some models. These can be replaced when necessary with 15 Ω ¼ W 5 per cent resistors.



STEREOGRAMS
STANDARD SPECIFICATION

Stereograms Full Specification

The diagram at the top of the next page gives details for Ferguson 205 STA and H.M.V. 2336, 2337 and 2340.



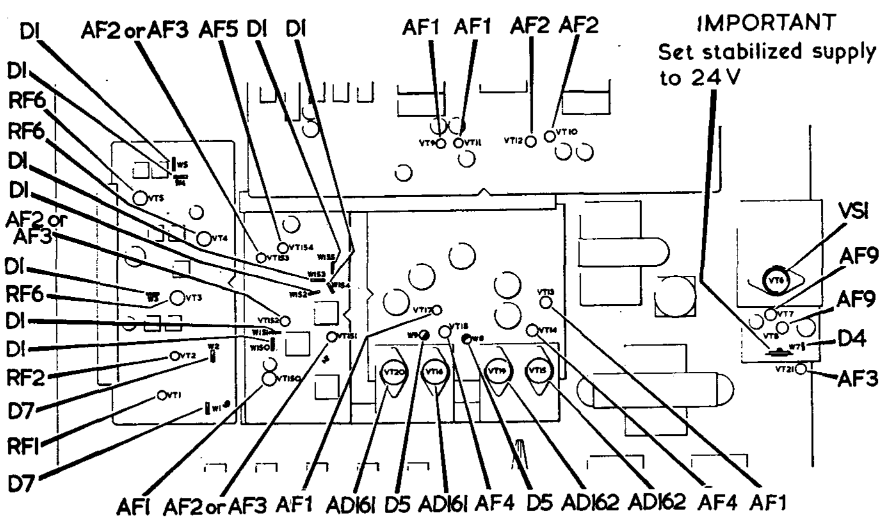
H211

FULL SPECIFICATION MODELS

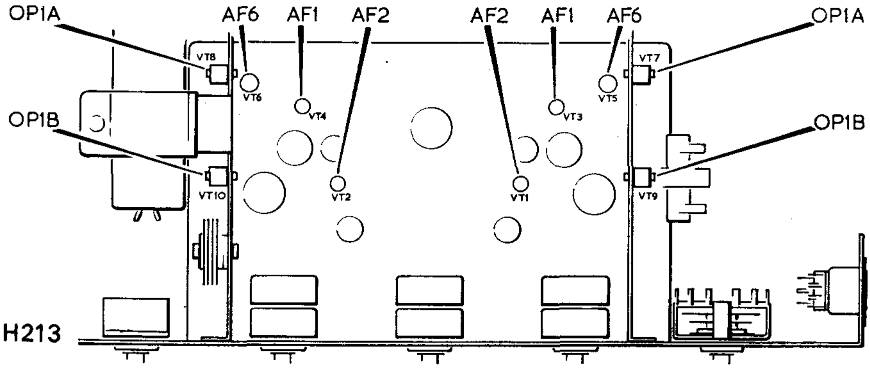
FERGUSON 205 STA

HMV 2336, 2337, 2340

Unit Audio: Ferguson models 206STA and 3400. Note that Ferguson 205STA is given with Stereograms Full Specification. The diagram which follows gives details of 206STA and 3400.



MODELS **FERGUSON** 206 STA & 3400 H212



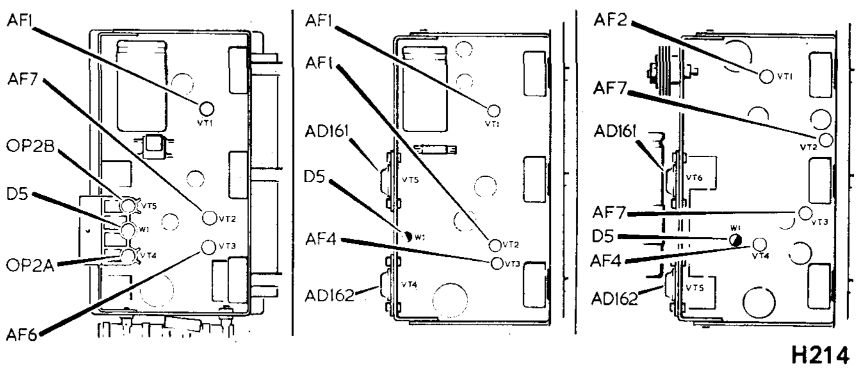
Record Players

(*a*) *Diagram H213*. H.M.V. model 2403. Marconiphone model 4403.

(*b*) *Diagram H214 (right-hand section)*. Ferguson model 3020. H.M.V. model 2030. Marconiphone model 4024. Ultra model 6018 Sch. A.

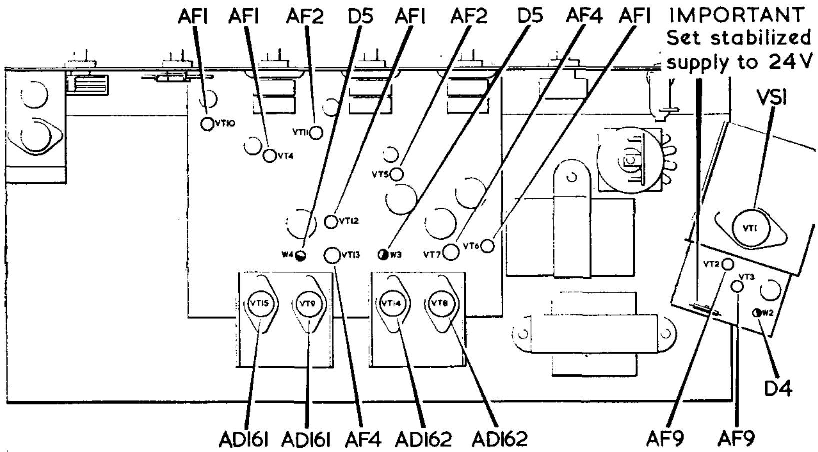
(*c*) *Diagram H214 (left-hand section)*. Ferguson models 3022 and 3024. H.M.V. models 2028 and 2038. Ultra model 6020.

(*d*) *Diagram H214 (centre section)*. Ferguson model 3026. H.M.V. model 2040. Marconiphone model 4028. Ultra model 6018 Sch. B.



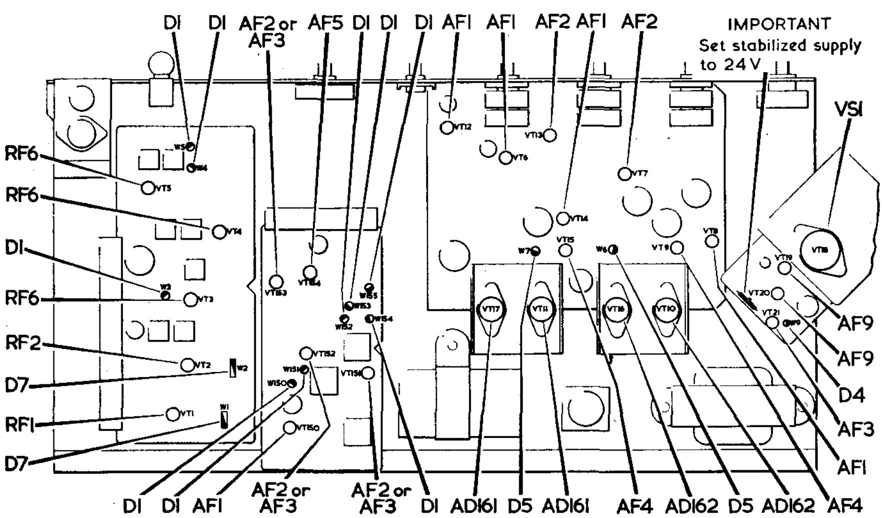
(H214) Record Players—see notes (*b*), (*c*) and (*d*) above

Stereomaster: Details are shown in the diagram (H215) at the top of the next page.



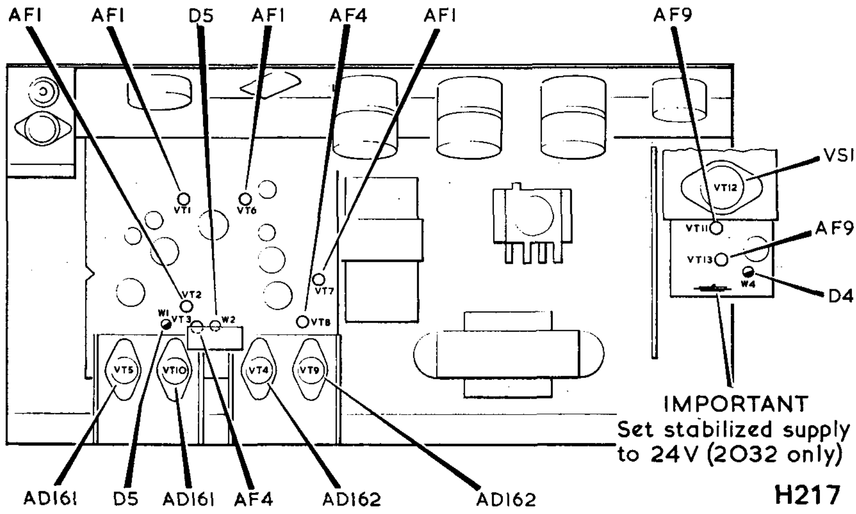
H215 **MODEL** HMV 2400

Stereomasters With V.H.F. Radio: The following diagram (H216) gives details for H.M.V. 2401 and 2402.



MODELS HMV 2401 & 2402 H216

Stereomaster—Stereomajor: See diagram (H217) overleaf for details.

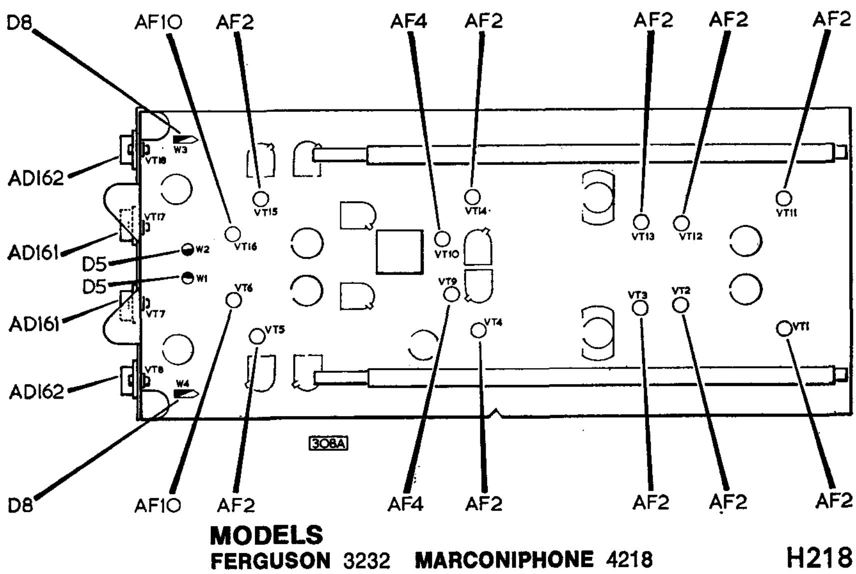


(H217) Stereomaster; H.M.V. 2032 (Early Production); Ferguson 3018; Marconiphone 4018

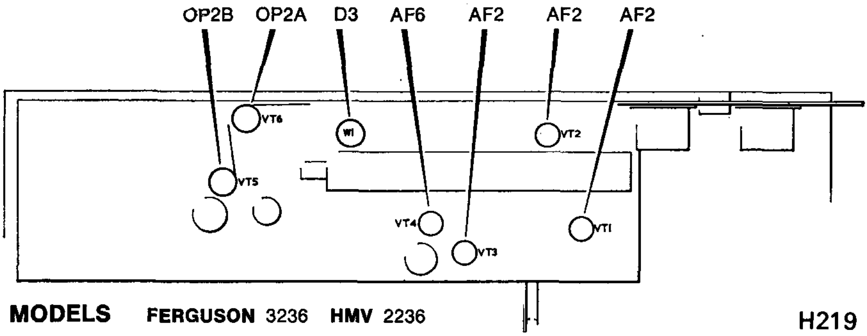
Tape Recorders

Differences, for both categories are illustrated below:

Stereo Tape Recorders: The diagram H218 gives details.



Cassette Tape Recorders: The following diagram (H219) gives details for Ferguson 3236 and H.M.V. 2236.



Heatsink Compounds: Heatsink grease is applied to output transistors during production and it must always be reapplied by the engineer when replacing a transistor in its heatsink during servicing.

Heatsink compound DP2623 or anti-tracking grease MS4, is suitable and marketed by Midland Silicones Ltd.

B.R.C. Classification Numbers and Base Diagrams

AF1

High Gain PNP
D1569 (2N4062) Base A
BC214L Base A
U3846 Base D
BC154 Base D
BC253B Base Q
BC263B Base D
MPS6522 Base B
MPS6523 Base B
BC259B Base Q
BC179B Base D
2N4058 Base A

AF2

High Gain NPN
D1568 (2N3711) Base A
2N3707 Base A
BC184L Base A
U3540 Base D
BC114 Base D
BC173 Base Q
BC109 Base D
MPS6520 Base B
MPS6521 Base B
BC169 Base Q

AF3

High Gain NPN
2N3711 Base A
BC183LB Base A
BC172B Base Q
BC108B Base D

AF4

NPN Driver 600mW
U3847 Base D
BC119UA Base D
BFY52 Base D
BC140D Base D
BSY54 Base D
TIS90 Base A

AF5

PNP Germanium
AC142 Base D
AC153 Base D

AF6

NPN Driver 300mW
U3832 (BC115) Base D
BC107 Base D
BC183LB Base A
TIS90 Base A

AF7

PNP Germanium
AC156 Base D
AC151 (Group 5, 6 or 7) Base D
AC192 Base D
OC75 Base D

AF8

PNP Germanium Driver
AC138 (Group 5, 6 or 7) Base D
AC151 Base D

AF9

PNP Germanium Driver
AC138 (Group 4 & 5 only) Base D

AF10

PNP Driver 600mW
U3845/2 Base D
2N2904 Base D

OP1A

Output PNP
AC153K Base D
AC142K Base D

OP1B

Output NPN
AC176K Base D
AC141K Base D

OP2A

Output PNP
AC128 Base D

OP2B

Output NPN
AC176 Base D

D1

G.P.Signal Diode
OA90, AA112, SFD104

D2

G.P. *Diode*
BA151, BA147

D3

Output Bias Stabilizer
A8A21, D3

D4

Zener Diode
BZX19, 1S2150A,
MR150, BZY85/C15

D5

Output Bias Stabilizer
AC169, 4160 Base D

D6

Varicap Diode
BA110, BA121

D7

Varicap Diode
BB103

D8

Silicon Diode
BY124, Y730

RF1

NPN Silicon
BF160 Base D
BF216 Base A

RF2

NPN Silicon
BF160 Base D
BF217 Base A

RF3

NPN Silicon
BF273 Base E
BF237 Base C
BF218 Base A

RF4

NPN Silicon
BF274 Base E
BF238 Base C
BF219 Base A

RF5

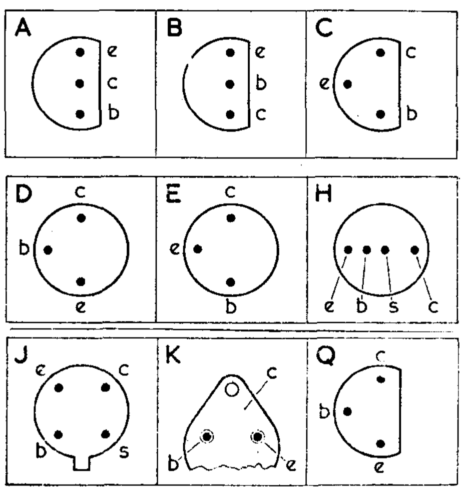
Germanium PNP
AF125 Base J
AF115 Base H

RF6

Germanium PNP
AF126 Base J
AF116 Base H

VS1

Germanium Volt Stab
AD143 (Groups 4 & 5)
Base K



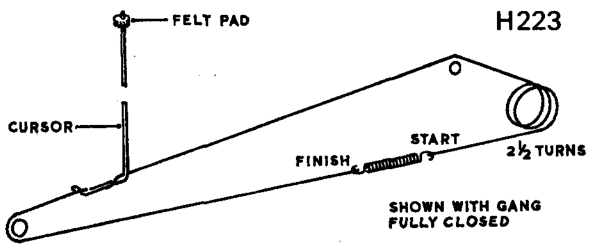
H220

(H220) Base Diagrams

BRC — Model 5398

General Description: All-transistor stereogram with an output power of 1·8 W per channel. Record changer: BSR UA25 or UA27 with SX5H cartridge and turnover stylus ST8. Aerials: ferrite rod (M.W. and L.W.) and external socket (S.W.). Two loudspeakers, elliptical, 30 Ω. Mains voltage range, 200/240 V 50 Hz.

Wavebands: L.W.: 1120–2027 metres. M.W.: 185–566 metres. S.W.: 16·7–51·5 metres.



(H223) Drive Cord —Model 5398

Dismantling for Service

(1) Chassis Removal: Pull off knobs, then remove chassis compartment back cover and disconnect S.W. aerial lead from printed board. Remove two screws securing chassis, located under front edge of cabinet, then release one screw and washer securing scale backing plate inside cabinet. The chassis can now be pulled out of cabinet within the limits of the interconnecting leads. To remove chassis completely, pull off loudspeaker and pick-up leads from tags on printed board, then disconnect leads to printed board assembly from terminal block under cabinet floor and screened by cabinet base cover. In all the above movements note colour coding for ease of reassembly.

(2) Record Changer Removal: Screw transit screws down to fullest extent to free record changer then remove base cover. Turn the clips on the record changer transit screws to enable them to pass through motor board. Remove leads to motor from terminal block and pull off the pick-up leads from tags on printed board, then lift record change clear of cabinet.

(3) Stylus Replacement: Place indicator flag in L.P. position and prise out stylus using indicator flag as a lever. When replacing new stylus prise open locating clip with thumbnail and slide end stock of stylus into position. After replacement ensure that the stylus arm is engaged properly within the V-shaped fork of the cartridge.

Audio Output Check: 1. Connect a 30 Ω impedance output meter in place of each loudspeaker, alternatively connect an oscilloscope across each loudspeaker and observe output waveform. 2. Switch to "GRAM" and turn volume control and tone control to maximum. 3. Pull of pick-up leads from

tags on printed board, then inject a 2·0 V 800 Hz signal from an audio oscillator into the right-hand pick-up input tags (A & C) and note output, this should be 1·5 W clean and unclipped. Transfer audio signal to left-hand pick-up tags (B & C) and note output from this channel. This should also be 1·5 W. The outputs should be within 2 dB of each other. 4. *Tone Control Check:* With test conditions as previously, inject an 8000 Hz audio signal to right-hand and left-hand channels respectively. Turn tone control to minimum and note change in output level, this should drop by 20 dB.

Alignment Procedure: Remove chassis as described in "Dismantling for Service". Connect an output meter adjusted for 30 Ω impedance in place of left-hand or right-hand loudspeaker, or a 20,000 ohm/volt meter set to a suitable A.C. voltage range across the left-hand or right-hand loudspeaker. Zero, trim and pad markers are provided on the scale diffuser.

(*a*) *I.F. Circuits:* Switch receiver to M.W.; turn gang to maximum capacitance position with volume and tone controls at maximum. Inject a 475 kHz, 30 per cent modulated signal via a 0·1 μF capacitor into aerial section of tuning capacitor (C5), then peak L16, L14, L13 and L12 in that order for maximum output adjusting signal input level as required to maintain an output level of 50 mW. On completion of alignment the generator output should be of the order of 15 μV.

(*b*) *R.F. Circuits:* M.W. should be aligned first. 30 per cent modulated signals should be injected via a loop loosely coupled to the ferrite rod aerial. Check that cursor registers with the zero mark on calibration strip. S.W. signals should be injected via a 20 pF capacitor into the S.W. aerial socket.

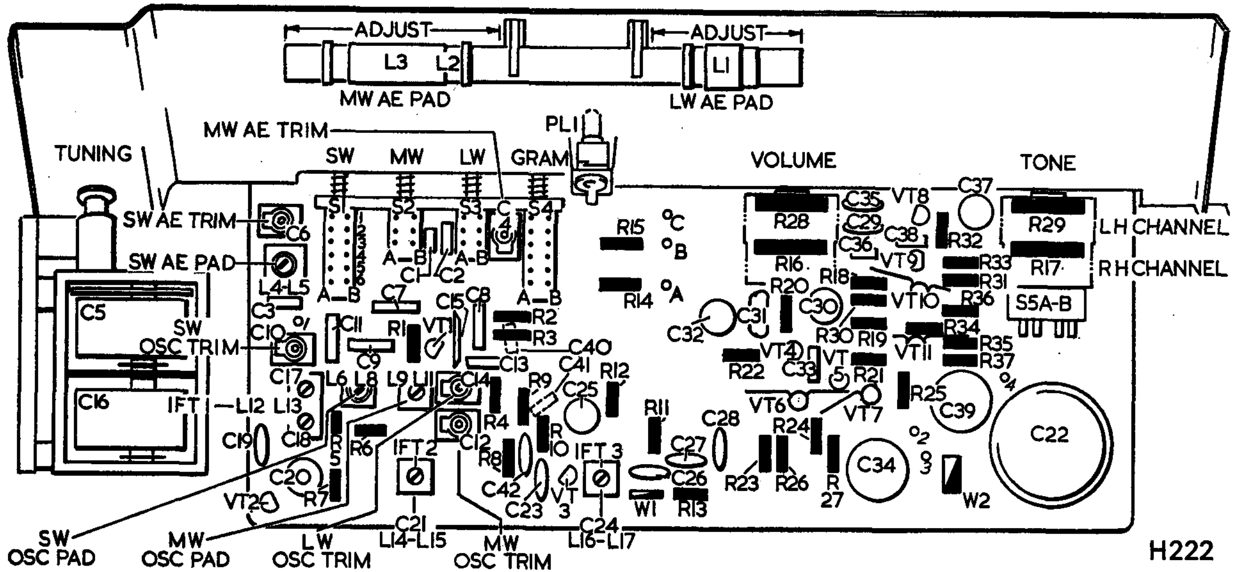
Range	*Sig. Gen.*	*Cursor Position*	*Adjust*
M.W.	600 kHz 1400 kHz	M.W. pad M.W. trim	L10, L3* C12, C4
L.W.	220 kHz	L.W. 220 kHz	C14, L1*
S.W.	6·7 MHz 15·8 MHz	M.W. pad M.W. trim	L7, L4 C10, C6

* Adjust by sliding coil along ferrite rod.

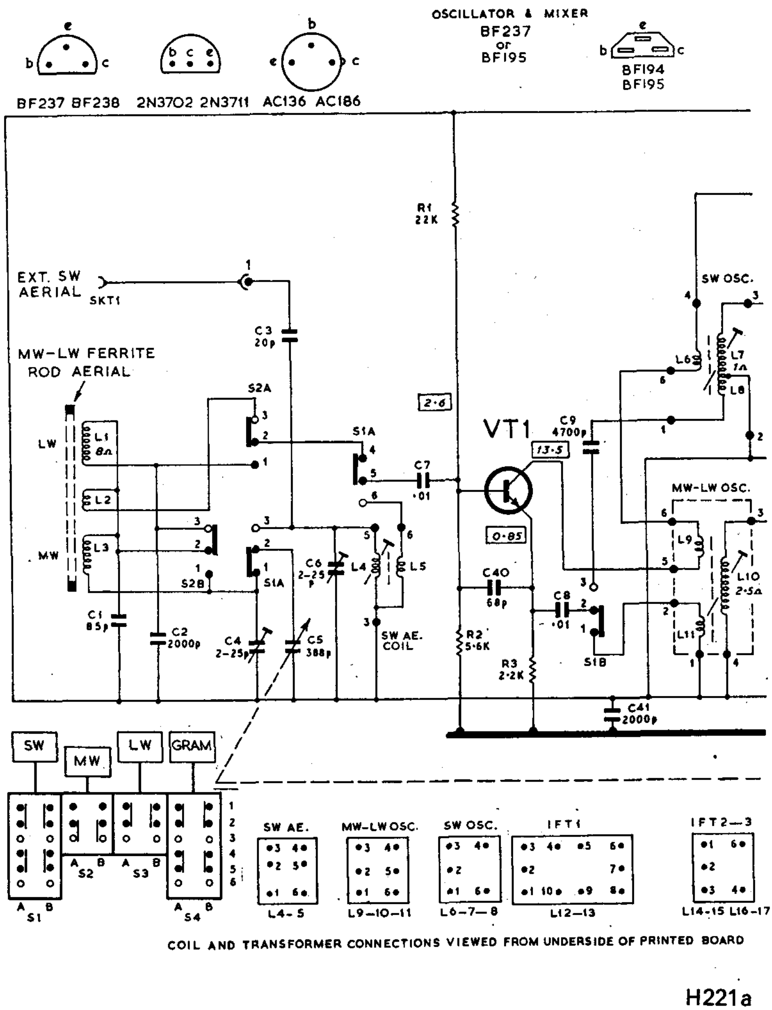
Frequency Modifications: Alignment may be carried out with the chassis *in situ*, in this case the glass scale may be used but the calibration frequencies require slight modification as follows:

Range	*Sig. Gen.*	*Cursor Position*	*Adjust*
M.W.	600 kHz 1500 kHz	500 metres 200 metres	L10, L3* C12, C4
L.W.	200 kHz	Centre of B.B.C. 2	C14, L1*
S.W.	7·0 MHz 16·0 MHz	7 MHz 16 MHz	L7, L4 C10, C6

* Adjust by sliding coils along ferrite rod.

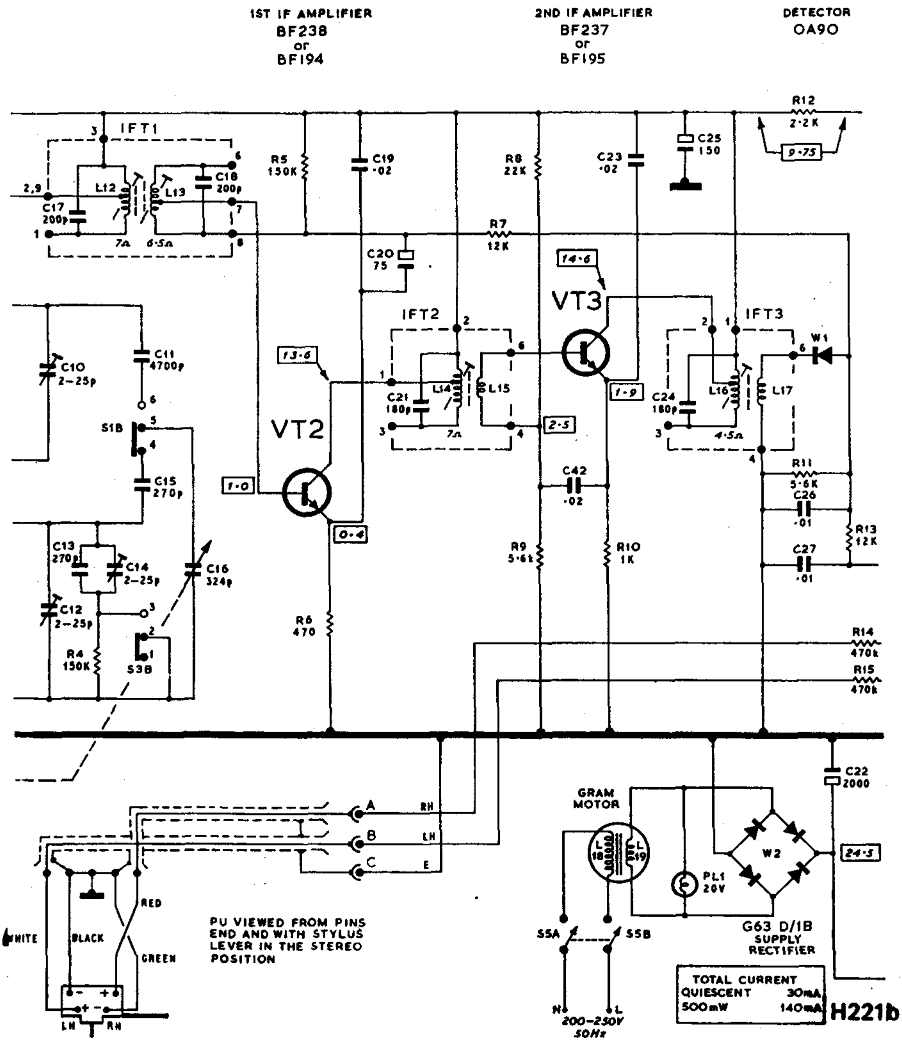


(H222) Component Locations and Alignment Adjustments—Model 5398



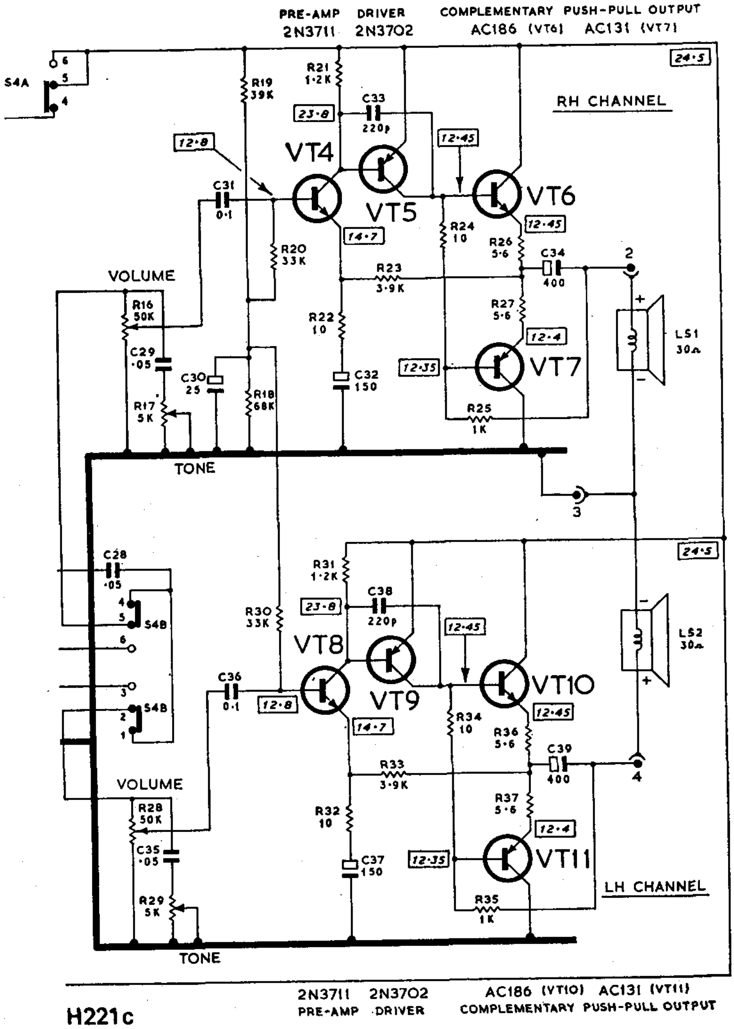
(H221a) Circuit Diagram—Model 5398 (Part)

Alternative Output Transistors: Output transistors used in the circuit arrangement shown are marked AC131F and AC186F. In receivers marked Schedule C, AC131 and AC186 transistors without the suffix F are used. In these receivers R24 and R34 are each replaced by a diode connected transistor, type ANK with the collector connected to the AC186 base and the base-emitter connected to the AC131 base. In addition, a 27 Ω resistor in series with a 1 μF reversible electrolytic is connected across each loudspeaker.



(H221b) Circuit Diagram—Model 5398 (Part)

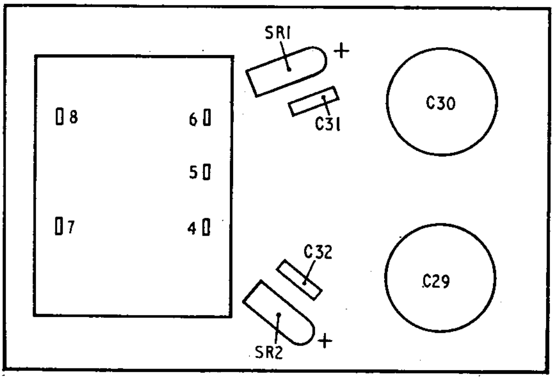
Circuit Diagram Notes: Voltage measurements shown in rectangles were taken relative to each transistor's positive chassis line (except where otherwise indicated) with a 20,000 ohms/volt meter, and with a mains input of 245 V. D.C. resistance readings are shown against inductors where these are 1 ohm or greater.



(H221c) CIRCUIT DIAGRAM—MODEL 5398 (CONTINUED)

BUSH Models SG55 and SG55W

General Description: These models are stereophonic record players incorporating ten transistors and two diodes. They are designed for operation on A.C. mains supplies of 50 Hz over the range 200 to 250 V. Independent bass and treble controls are provided and the two loudspeakers for each channel are housed in acoustically loaded chambers.



F91

(F91) Power Unit Layout —Models SG55 and SG55W

Power Supply: 200 to 250 V A.C. 50 Hz (30 W). The chassis is isolated. When dispatched from factory, the mains tap is set for 230/250 V operation.

Note: A special motor will be required if the instrument is to operate on 60 Hz.

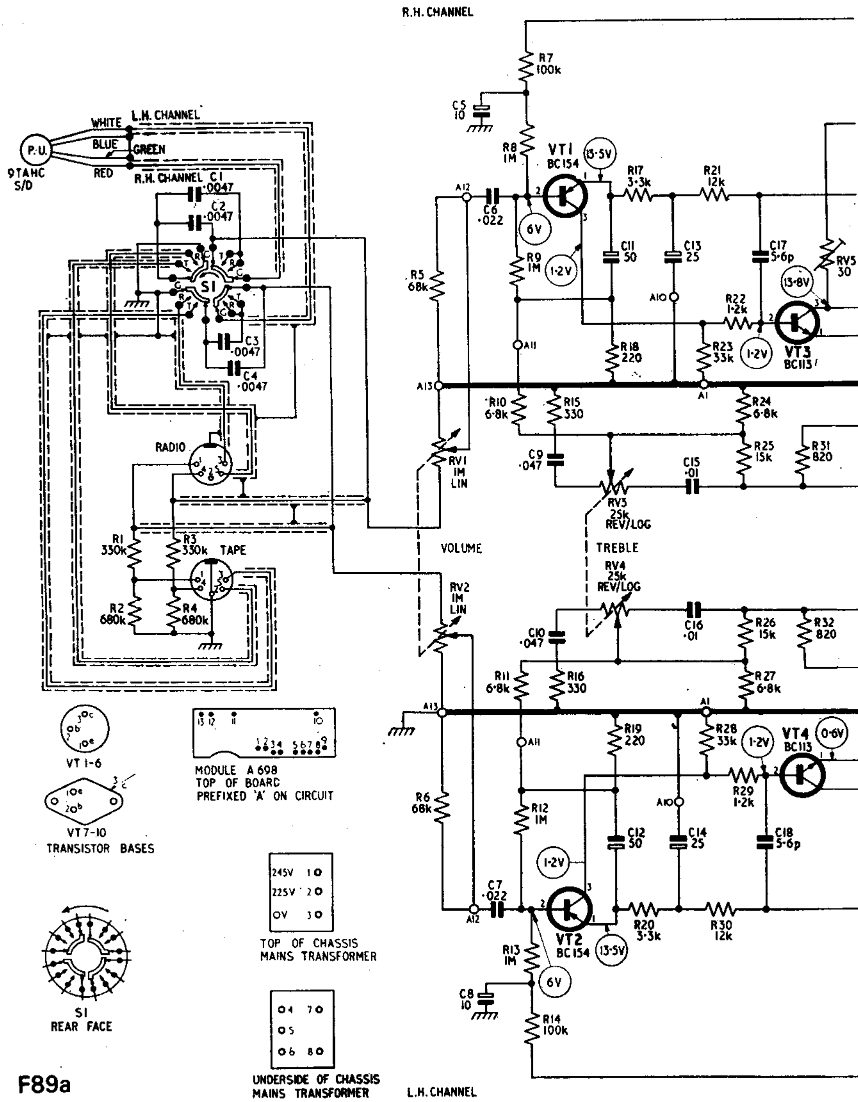
Amplifier Performance (Each Channel): 1. Sensitivity is 1·5 mV at 1 kHz for 50 mW output, and 18 mV at 1 kHz for 7 W output. 2. Power output is 7 W music power rating. 3. Output impedance at tape socket is greater than 330 K. 4. Input impedence at tape socket is 68 K to 0·5 M. 5. Input to tape socket is 50 mV maximum. 6. Treble control range is 10 dB at 10 kHz relative to 1 kHz. 7. Bass control range is 9 dB at 50 Hz relative to 1 kHz. 8. The phase is such that a negative voltage at the input socket causes an outward movement of the speaker core.

Gramophone Unit: SG55W, Garrard model 3500, 3-speed manual and automatic record player. SG55, same as SG55W.

Radio Input: The monophonic or stereophonic output of a radio receiver can be reproduced by connection to radio input socket. The lead supplied is only suitable for monophonic reproduction.

Tape Recording: The tape socket allows the amplifier to be used for tape recording or playback. The loudspeaker remains in circuit and can be used for monitoring.

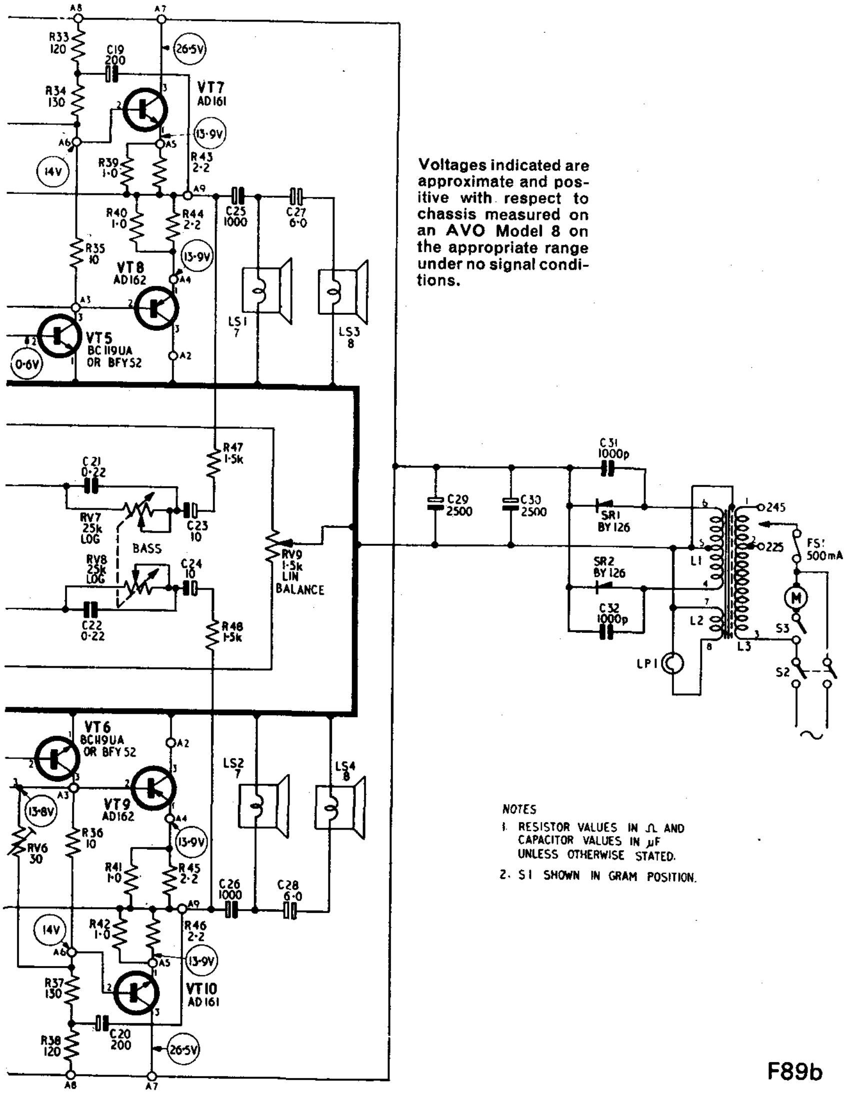
Adjustment of RV5 and RV6: When components in the output stage have been changed, the quiescent current in the output transistors should be checked. If necessary adjustment is made by RV5 and RV6.



F89a

(F89a) Circuit Diagram—Models SG55 and SG55W (Part)

(*a*) *Right-hand Channel.* Set volume control to minimum. Disconnect lead to collector of VT7 at connection 7 on the printed board. Connect Avo 8 (10mA range) at connection 7 between VT7 collector and positive supply. Adjust RV5 for a reading between 6 to 10mA at a room temperature between

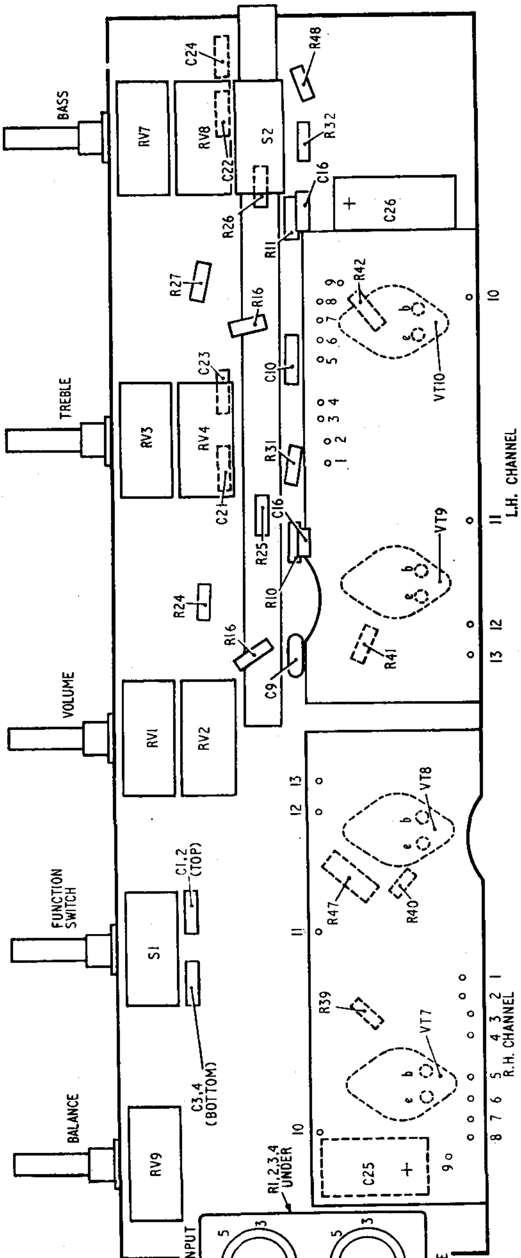


(F89b) Circuit Diagram—Models SG55 and SG55W (Continued)

65 to 75 degrees Fahrenheit.

(*b*) *Left-hand Channel.* Similar to the procedure for right-hand channel. Adjust RV6 to set VT10 collector current.

Dismantling and Reassembly: Disconnet from mains supply. Clamp the



F90

(F90) Chassis Layout—Models SG55 and SG55W. Note that C27 and C28 are Mounted in the Loudspeaker Enclosures

record changer unit to baseboard by turning the two transit screws fully counterclockwise. Secure pick-up arm to its rest by plastic clip and fit stylus guard.

1. **Access to Main Chassis (for Voltage Checks) and Pilot Lamp:** Remove the three screws securing the perforated cover inside the record changer compartment. Lift cover out of groove in which it rests.

2. **Access to Fuse, Pilot Lamp, Loudspeaker, Power Unit and Interconnections:** Remove cabinet base by unscrewing the fixing screws. The power unit is held in position by two nuts. Note that the cabinet base forms part of the two acoustic chambers. When reassembling, make sure that the plastic foam sealing strip is in position and screw the base down firmly.

3. **Access to the Main Chassis:** Remove the cabinet base (see 2). Disconnect the leads from the main chassis at the four terminal blocks. Remove plastic strap clamping the mains lead to the cabinet. Remove green lead screwed to the power unit chassis. Unplug the two screened input leads at base of player unit.

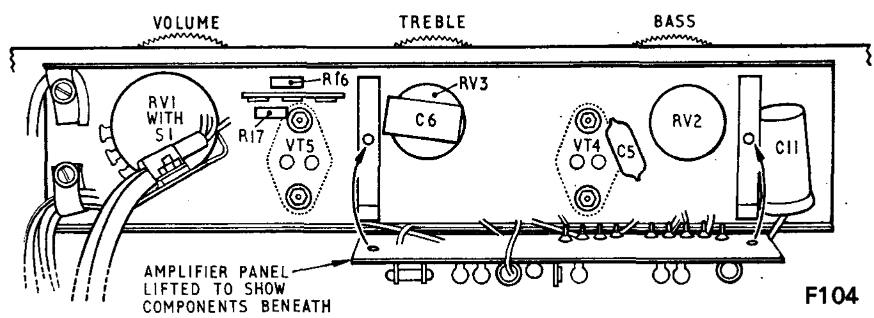
Remove the perforated cover (see 1). Remove the two screws at the ends of the wooden spar under perforated cover. Slide control panel towards back of cabinet and carefully lift control panel with chassis upwards. Note that all leads to the connector blocks are colour coded.

4. **Access to Printed Panels and Other Components:** Limited access is possible as in item 1 above. For full access remove main chassis (item 3), then the two screws retaining the printed panels.

BUSH — Models SRP51 and AU51

General Description: Model SRP51 is a record player and model AU51 is an amplifier unit.

SRP51: Model SRP51 is a three-speed automatic, transistorised high fidelity record player, for operation on A.C. mains only. The pick-up is fitted with a dual turnover stylus and is suitable for both monaural and stereophonic



(F104) Chassis Layout—Models SRP51 and AU51

recordings. For the reproduction of stereophonic recordings, an additional amplifier and loudspeaker will be required and the AU51 has been specially designed for this purpose. The record player may also be used as the second amplifier for the stereo output from a second record player.

AU51: Model AU51 has been designed primarily as the second amplifier for the stereo output signal derived from the SRP51. The unit may, however, be used in conjunction with a tape recorder or gramophone pick-up giving a suitable output. The circuit is similar to that of the SRP51 and the information applies to both models unless stated otherwise.

Voltage Range: 200–250 V A.C. only 50 Hz.

Power Consumption: SRP51 (18 W), AU51 (10 W).

Input Impedance: 1 M.

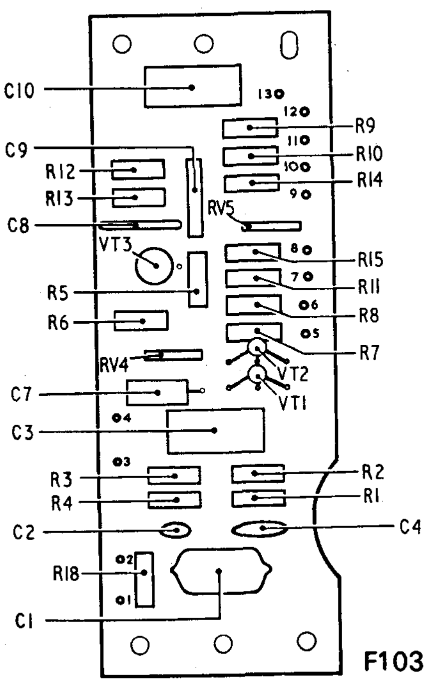
Power Output: 5 W.

Sensitivity: 250 mV for 3 W output.

Tape Recording: A 5-pin DIN type socket, marked TAPE, is fitted providing a low impedance signal for feeding a tape recorder. The input mipedance of this socket is 47 Ω. If required a playback signal may be fed to the appropriate pins of this socket, the input impedance depending on setting of volume control.

Loudspeaker: Elliptical, 15 Ω.

Phase: A negative input voltage produces an outward movement of loud-sdeaker core.



(F103) Amplifier Component Locations —Models SRP51 and AU51

Gramophone Unit: The SRP51 is fitted with a Garrard 3500 3-speed automatic record changer with a sonotone 9TA HC/G ceramic stereo cartridge.

Adjustment of RV4 and RV5: Replacement of components in the driver or output stages may necessitate the resetting of RV4 and RV5. These pre-set controls should be reset in accordance with the following procedure: 1. With volume control set to minimum, set the two pre-set controls to their mid positions. 2. Measure H.T. voltage at pin 12 on printed panel. 3. Measure voltage at junction of R14 and R15. This should be exactly half the H.T. voltage; adjust RV4 to correct if necessary. 4. Disconnect the collector of VT4 from pin 11 on printed panel and insert an Avo model 8 positive to pin 11 and negative to VT4 collector, 10mA range. 5. Adjust RV5 for a reading of 6–7mA at 65° F (18° C). 6. Reconnect collector of VT4 to pin 11.

Stereophonic Operation: Stereophonic records may be played by the record player with the addition of a suitable audio amplifier and loudspeaker, and a length of coaxial cable with suitable connections, i.e. Type A731 (supplied with the Model AU51). Connect a suitable length of coaxial cable from the socket marked STEREO to the input socket of the second amplifier. This second amplifier should form the left-hand channel of the system, while the SRP51 constitutes the right-hand channel.

Note: The SRP51 may be used as the second amplifier for the stereo output signal derived from another record player; the stereo output from the master player should be coupled to the socket marked AMP. of the SRP51. Positions of the two loudspeaker systems should correspond with left- and right-hand outputs of pick-up head on the master player.

Replacement of Stylus: The record player is fitted with a Sonotone 9TA HC/G pick-up cartridge with styluses for long playing and 78 r.p.m. records fixed either side of a common shank. If a stylus requires replacement, the whole assembly with shank and turnover lever must be replaced. Procedure is as follows: turn stylus selector lever until it is set vertically downwards then, holding the pick-up head, disengage assembly by pulling downwards. Insert new stylus assembly, ensuring that turnover lever is correctly positioned between the locating lugs and that the stylus shank lies centrally in the actuator fork. Replacement stylus is a dual point sapphire type N9TAHCS.

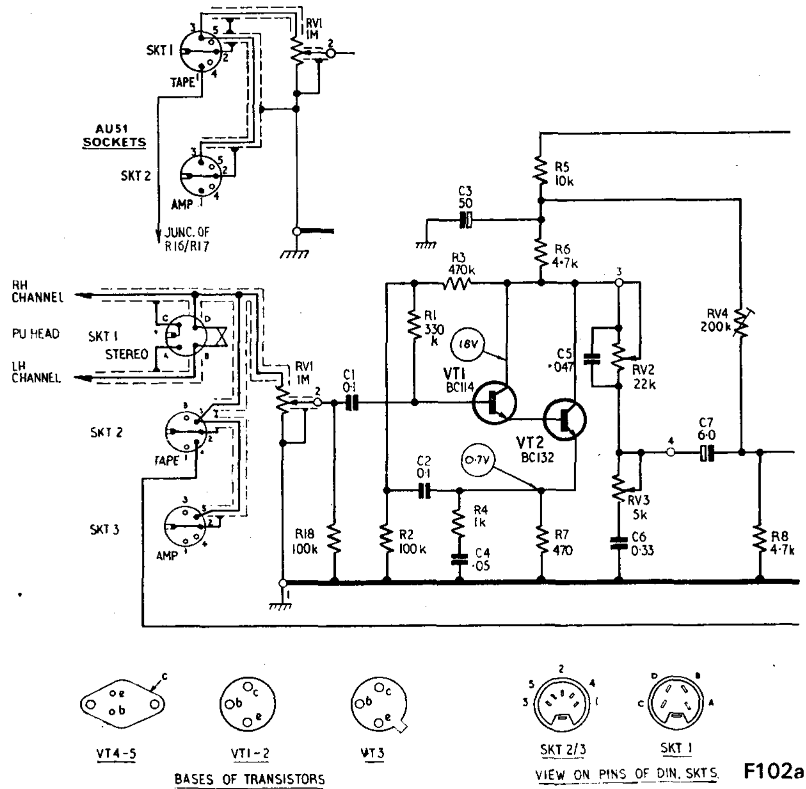
Dismantling:

(*a*) *SRP51:* To gain access to amplifier, remove the two self-tapping screws with cup washers from partition adjacent to pick-up arm. Lift control panel and release it from groove in side of cabinet; complete assembly may now be lifted clear to the extent of leads.

For access to loudspeaker compartment and mains adjustment tappings, remove the two wood screws securing the sloping panel in front of the record changer and release panel from groove in the motorboard.

The panel carrying the input/output sockets and the pilot lamp may be removed by unscrewing the two wingn-uts from the underside of panel.

To gain access to underside of record changer, first clamp unit to the motorboard by means of the transit screws. Secure pick-up arm to its rest, remove



(F102a) Circuit Diagram—Models SRP51 and AU51 (Part)

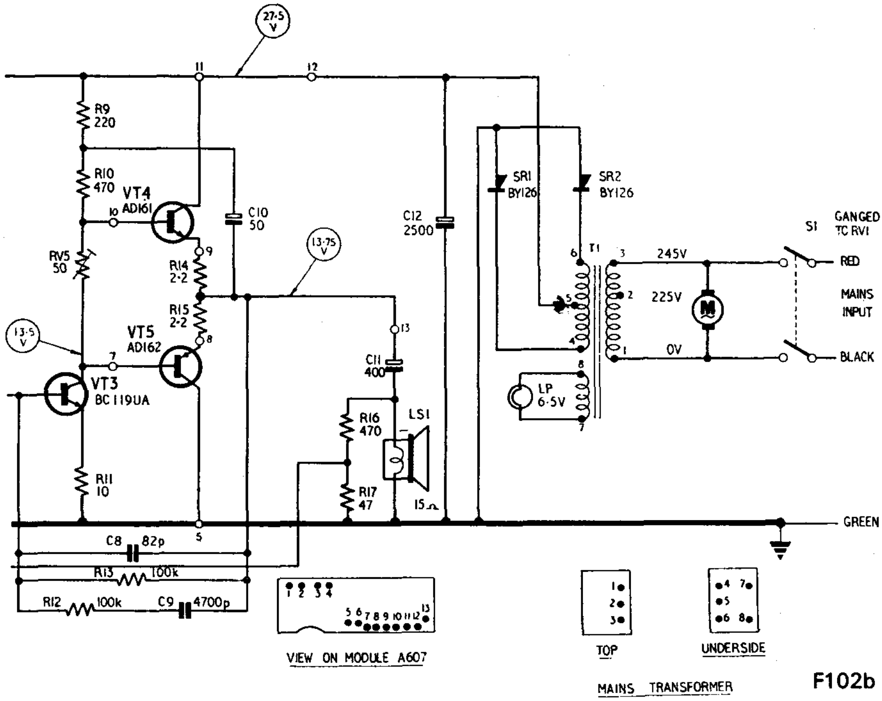
the four Phillips-headed screws (with cup washers) around edge of motor-board, lift record changer with its board by means of the extended transit screws, to extent of leads.

(*b*) *AU51:* Removing back of unit gives access to most parts including the mains adjustment tappings. If necessary the amplifier chassis may be removed by pulling off the three control knobs, and removing the two screws revealed. The chassis may now be lifted clear to extent of leads.

Panel carrying input/output sockets and pilot lamp may be removed by unscrewing the three wing-nuts from underside of panel.

Note: When reassembling reverse the above procedures.

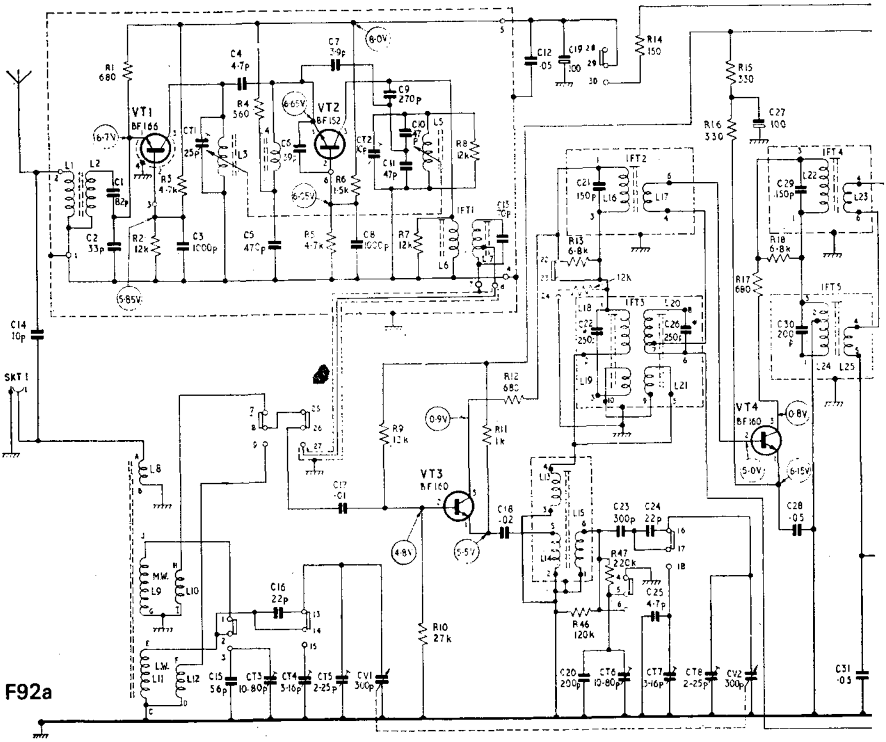
Circuit Diagram Notes: 1. Voltages indicated are *positive* with respect to chassis and measured with Avo No. 8 under no signal conditions and with volume control set to zero with mains tap at 245 V and a supply of 240 V. 2. All values of resistance in ohms and all values of capacitance in microfarads unless otherwise stated. 3. For circuit of AU51 delete Stereo output and pick-up connections also the motor (see inset for socket connections).



(F102b) Circuit Diagram—Models SRP51 and AU51 (Continued)

BUSH — Model VTR143

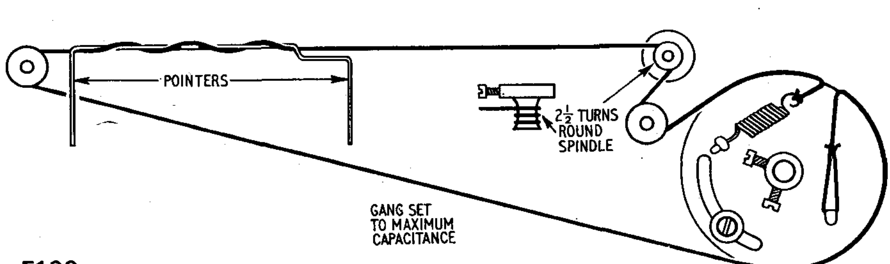
General Description: Battery-operated portable receiver using nine transistors and three diodes. The three versions of the VTR143 (/A, /B, /C) are electrically identical and differ only in presentation. Model VTR143/C has been made for the British Wireless for the Blind Fund, and uses for reasons of safety a telescopic aerial which cannot be tilted. Aerials; ferrite rod for A.M., telescopic rod for F.M. and a car aerial socket for all bands. A.M.I.F. 470kHz. F.M.I.F. 10·7MHz. Audio output, 1W for 10 per cent distortion. Loudspeaker: elliptical, 15 Ω. Battery: one 9V PP9. Phone socket, for an earpiece with an impedance of 20 to 1000 Ω. The internal loudspeaker is muted when the plug is inserted in the phone socket.



F92a

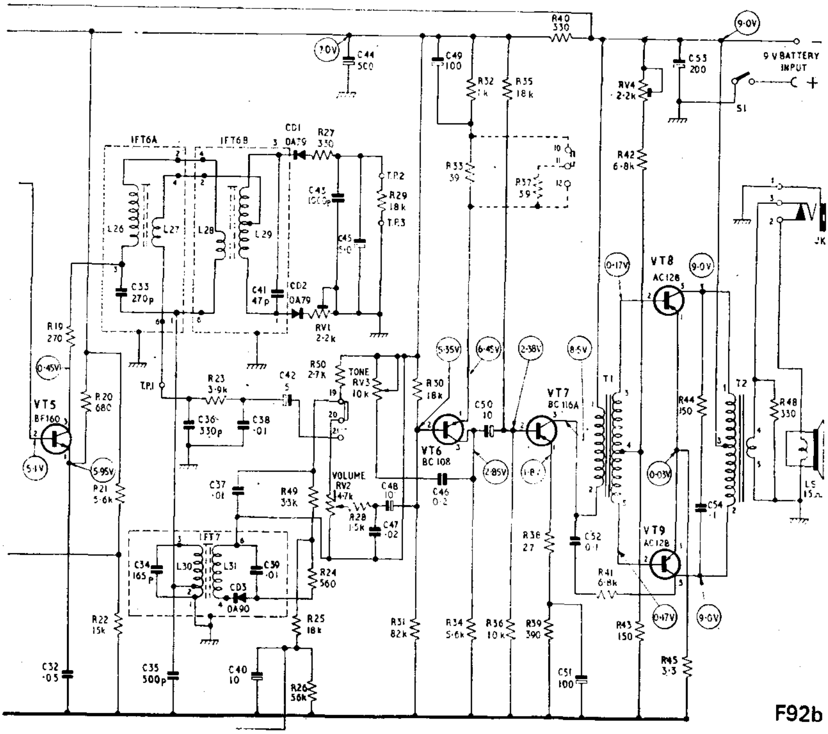
Above: (F92a) Circuit Diagram—Model VTR143 (Part)

Opposite: (F92b) Circuit Diagram—Model VTR143 (Continued). Connections are Detailed at the Foot of the Opposite Page.



F100

(F100) Drive Cord—Model VTR143



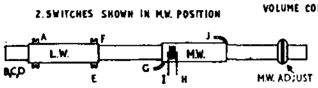
F92b

NOTES: 1. ALL VALUES OF RESISTANCE IN OHMS & ALL VALUES OF CAPACITANCE IN μF UNLESS OTHERWISE STATED.

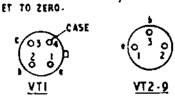
2. SWITCHES SHOWN IN M.W. POSITION

3. VOLTAGES INDICATED ARE APPROX & NEGATIVE WITH RESPECT TO CHASSIS, MEASURED WITH AVO No.8, 10V RANGE, UNDER NO SIGNAL CONDITIONS ON VHF, WITH VOLUME CONTROL SET TO ZERO.

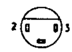
4. WHEN ALTERNATIVE I.F. TRANS. ARE USED, VALUES OF CAPACITORS MARKED THUS * BECOME 200p



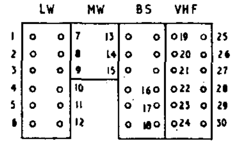
FERRITE AE CONNECTIONS



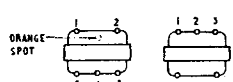
TRANSISTOR BASES



JACK SOCKET VIEWED FROM REAR



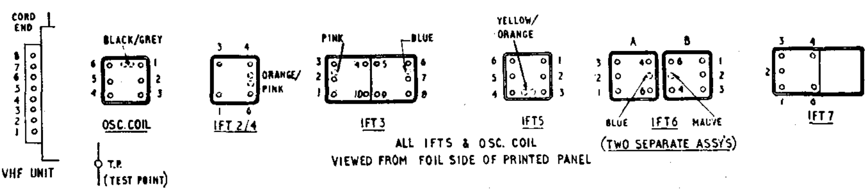
PUSH BUTTON SWITCH VIEWED FROM COMPONENT SIDE OF PRINTED PANEL



DRIVER TRANSFORMER

OUTPUT TRANSFORMER

OUTPUT & DRIVER TRANS. VIEWED FROM FOIL SIDE OF PRINTED PANEL



VHF UNIT

OSC. COIL

IFT 2/4

IFT3

IFT5

IFT6 (TWO SEPARATE ASSY'S)

IFT7

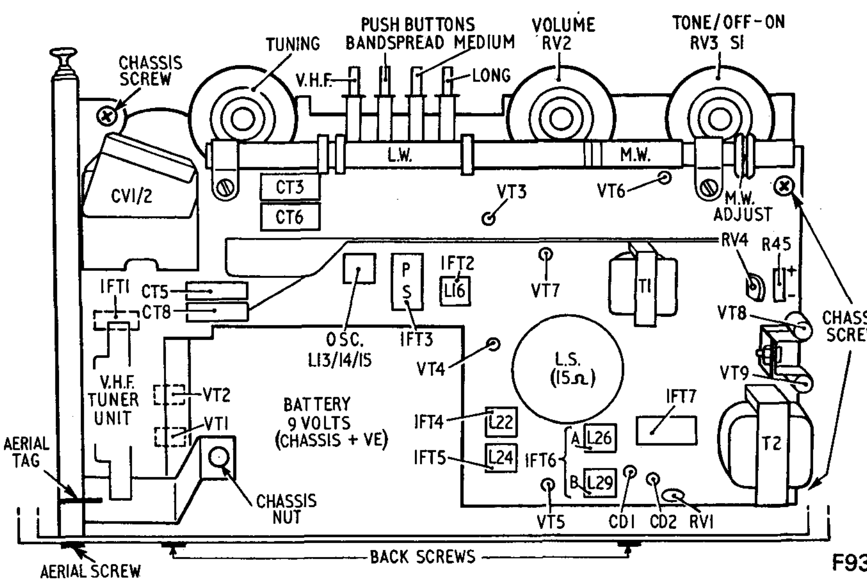
ALL IFTS & OSC. COIL VIEWED FROM FOIL SIDE OF PRINTED PANEL

Wavebands: V.H.F.: 87·5–100 MHz. B.S.: 187–210 metres. M.W.: 187–570 metres. L.W.: 1070–1900 metres.

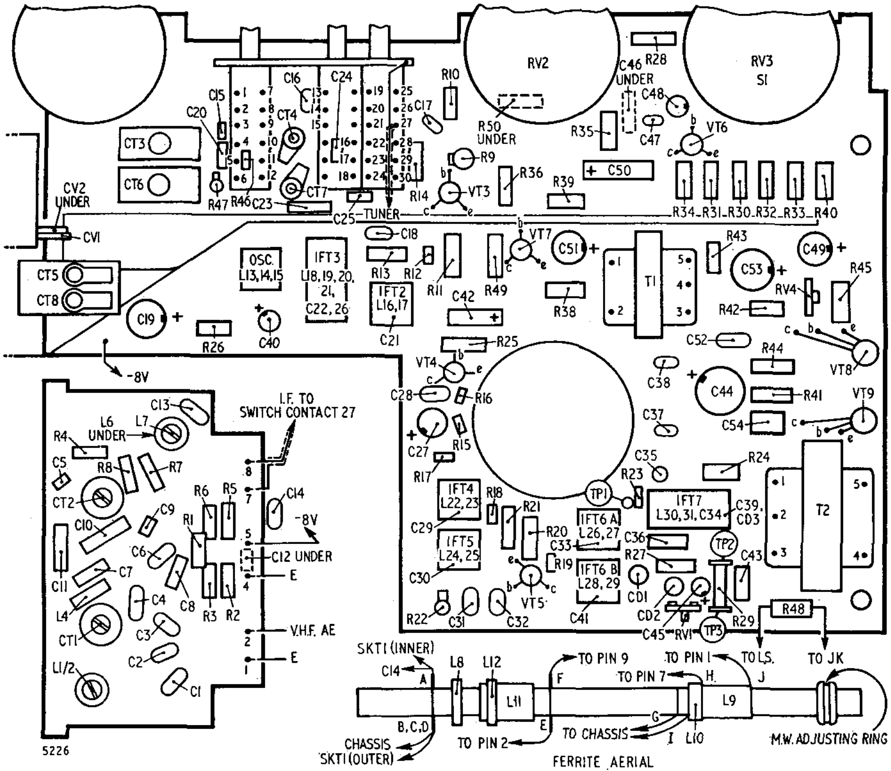
Adjustment of RV4: The pre-set resistor RV4 allows the quiescent current through the output transistors to be set at 8 mA. Adjustment should only be necessary if components in the output stage are replaced. The readings given below were taken at an ambient temperature of 70°F (21°C). Connect an ammeter in series with the battery and switch the receiver to F.M. With the volume control set at minimum, adjust RV4 until the meter reads between 22 and 24 mA. An alternative method which measures only the current in the output stage requires a millivoltmeter. Connect an Avo Model 8 set to the 50 μA range across R45. With the volume control set at minimum, adjust RV4 until the meter reads 10·5 μA (equivalent to a voltage of 26·5 mV across R45).

Chassis Removal: 1. Remove cabinet back, which is retained by two screws and disconnect leads to the external car aerial socket, disconnect battery. 2. Unplug lead at the bottom of telescopic aerial and remove the screw retaining the bottom of the telescopic aerial to cabinet. Remove aerial by sliding bottom of it out of the cabinet first. 3. Remove the three screws and one nut retaining the chassis and withdraw chassis to extent of loudspeaker leads. Slide bottom of chassis out first to free control knobs. 4. Replace by reversing the above procedure.

Removing V.H.F. Tuner from Chassis: 1. Disconnect the leads to pins 1, 2, 5, 7 and 8. 2. Set tuning capacitor to minimum capacity and remove locking screw on the V.H.F. calibration adjuster. Slip the loop of the F.M.



(F93) Rear View of Chassis—Model VTR143



R	4 8 7 1 6 26 46 13 12 17 11 50 9 49 21 39 35 27 28 34 31 30 44 48 41 40 45 3 5 22 10 18 25 36 19 38 23 43 32 33 47 2 14 15 16 20 29 42 24
C	11 5 10 7 6 19 9 8 15 40 16 24 26 18 29 31 32 33 51 50 35 48 34 54 53 49 2 3 13 1 23 14 25 21 17 30 42 36 37 47 52 39 4 20 12 22 28 27 41 46 45 38 44 43
MISC.	CT5 L4 CV1 CT3 L13/14/ CT4 IFT3 IFT2 L8 IFT5 L11 VT5 IFT6A L28/29 CD2 RV1 TP3 L9 RV3 T2 VT8 VT9 CT8 CT1 L6 CT6 15 CT7 L18/19/ VT4 IFT4 L24/25 L12 RV2 L26/27 TP1 L10 IFT7 TP2 S1 CT2 L1/2 CV2 L7 20/21 L16/17 L22/23 VT3 VT7 IFT6B CD1 T1 L30/31 VT6 CD3 RV4

F94

(F94) COMPONENT LOCATIONS—MODEL VTR143

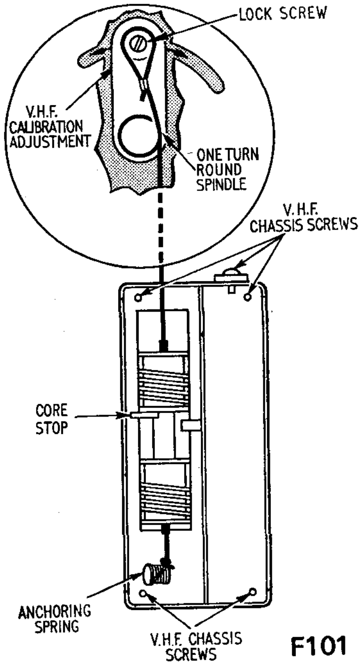
tuning cord from boss of calibration adjuster. 3. Remove the five screws securing the unit to main chassis. 4. Replace by reversing the above procedure.

Modifications: 1. In early models, C33 (270pF) was 260pF, C34 (165pF) was 180pF, and C41 (47pF) was 60pF. 2. In models with early types of I.F transformers, a 12kΩ resistor which improves stability was connected from pin 1 of IFT3 to contact 24 of the wave change switch. If IFT3 is replaced, this 12kΩ resistor should be removed. 3. C6 (39pF) was 33pF and C7 (3·9pF) was 3·3pF. The change improves V.H.F. oscillator performance. 4. C46 (0·2μF, now connected to VT6 collector) was connected to pin 20 of the wavechange switch. The change improves the tone control range and prevents possible instability at 940kHz. 5. In certain makes of IFT3, C22 (250pF) and C26

(250 pF) may be 200 pF. 6. Two types of volume control circuit are used. In early models RV2 is 5 kΩ, R33 is 150 Ω and R37 (39 Ω) is switched by contacts 10, 11 and 12. In later models RV2 is either 5 kΩ of 4·7 kΩ, R33 is 39 Ω, R37 is removed, switch contacts 10, 11 and 12 are no longer used and R49 and R50 are added. If a replacement volume control is required for an early model, order the complete kit shown in the parts list. For later models, only the control will be required.

Alignment (General): Set volume and tone controls to maximum output. Check that battery supply is 9 V. See alignment diagram. To prevent damage to output transistors, sound output meter (E) must have an impedance of 15 Ω or more, and maximum output must be less than 100 mW.

Alignment (A.M.): Follow procedure in A.M. alignment table. Always adjust signal generator output to maintain an output of 50 mW on meter E. See alignment diagram overleaf and tables opposite.



F101

(F101) F.M. Tuning Cord —Model VTR143

Alignment (F.M.): Set sig. gen. to 10·7 MHz, switch to V.H.F. and set scale pointer to 94 MHz. Set RV1 to its mid-position. Follow procedure in F.M. alignment table. Always adjust sig. gen. output so that meter F reads between 0·5 and 1 V. The outer alignment peak for the cores of L6 and L7 is the correct one. See alignment diagram. Note that adjustments to the V.H.F. tuner unit should not be made unless components are known to have been disturbed.

A.M. Alignment Table

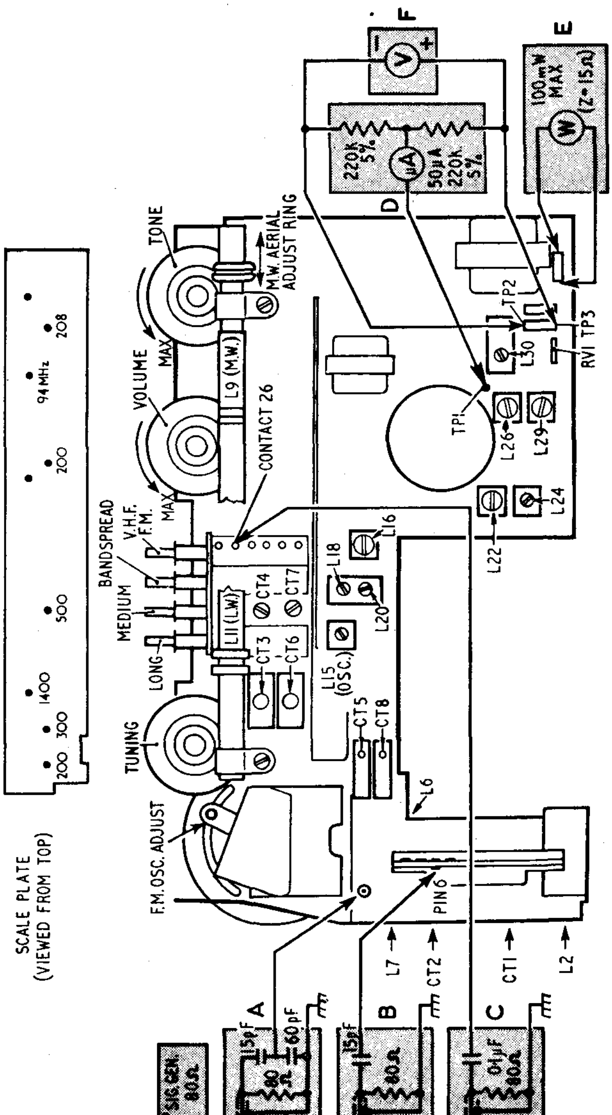
Operation	*Switch*	*Pointer (metres)*	*Sig. Gen. (kHz)*	*Adjust*
	I.F. Alignment. Sig. Gen. to C			
1	M.W.	300	470	L30
2	M.W.	300	470	L24
3	M.W.	300	470	L21
4	M.W.	300	470	L18
	R.F. Alignment. Sig. Gen. to A			
5	M.W.	500	600	L15
6	M.W.	200	1500	CT8
7	Repeat 5 and 6			
8	M.W.	500	600	L9
9	M.W.	200	1500	CT5
10	Repeat 8 and 9			
11	B.S.	208	1439	CT7
12	B.S.	200	1500	CT4
13	L.W.	1400	214	CT6
14	L.W.	1400	214	CT3

Notes: 1. Adjust L9 by moving ring on rod aerial. 2 Seal ring in position on rod aerial. 3. Check that L11 on rod aerial is sealed in position after alignment is completed.

F.M. Alignment Table:

Operation	*Adjust*	*Meter*	*Output*
	Connect Sig. Gen. to C		
1	L26	F	Max.
2	L29	D	Zero
3	L22	F	Max.
4	L16	F	Max.
5	RV1	E	Min.
6	L26	F	Max.
7	L29	D	Zero
	Connect Sig. Gen. to B		
8	L6	F	Max.
9	L7	F	Max.
10	L6	F	Max.
	Connect Sig. Gen. to A		
11	L3	F	Max.
12	L2	F	Max.

Notes: 1. Sig. Gen. output must be 1 mV when RV1 is adjusted. 2. L3, L6 and L7 cores are tuned to outer peak. 3. When L3 is altered adjust lever on drive cord drum, then tighten lock screw. 4. Tune sig. gen. to 94 MHz when signal is injected at A.



F99

(F99) Alignment Diagram—Model VTR143

DANSETTE "Regina"

General Description: Five-transistor record player. Power output 6W undistorted. Frequency response level from 20c/s to 20kc/s. Record player unit Garrard 3000 with 9TA cartridge. Power supply 220–240V A.C. only. Sockets for external loudspeaker, tape recorder and stereo unit.

Transistors: AC128, AD161, AD162 and two BC108.

Stylus Replacement: Raise arm and set stylus assembly mid-way between 78 and L.P. position, so that stylus lever protrudes outwards from cartridge. The assembly springs out by rotating forwards. Lay new stylus in mid-way position, rotating it into the plastic clamps. Set to 78 or L.P. position and lower the arm. When replacing stylus care should be taken not to exert undue pressure on the point to avoid damage.

Circuit Description: The circuit incorporates a 6W mains operated solid state amplifier, comprising two BC108 voltage amplifier stages, and a driver, feeding a current compensated, complementary push–pull output.

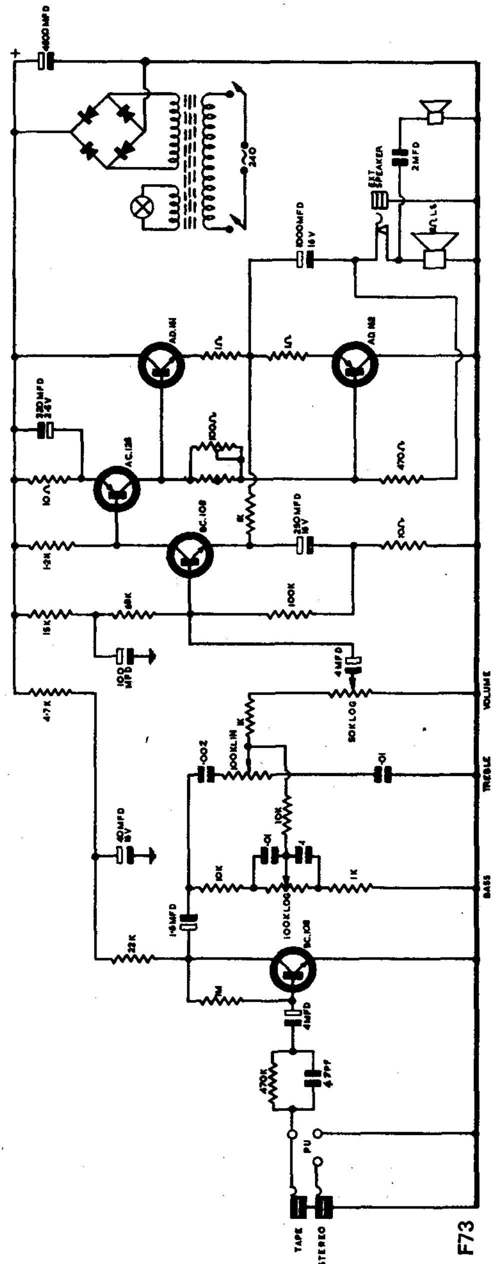
Signals from the stereo pick-up cartridge are fed, via a compensating filter, to the first transistor which is current biased. Signals amplified in this stage are fed to a passive tone network providing bass and treble boost. Volume control shunts output from tone controls and feeds a controlled signal into the second transistor. In this stage the signal is once again amplified and directly coupled to the driver which provides a constant current into the output pair. The bases of the output transistors are coupled together by a thermistor shunted by a variable pre-set resistor. The correct quiescent current is set by the pre-set and the thermistor compensates for changes in temperature, etc.

The output from the centre point AD161–AD162 is capacitively coupled to the 8 Ω speaker load, and a simple crossover coupling is employed to energise the 15 Ω tweeter.

Circuit Diagram: The circuit is illustrated overleaf.

DANSETTE "Mod"

General Description: This model, apart from circuit changes around the volume control (no tape output socket) and output stage (no extension loudspeaker socket), is electrically similar to the Herald, information for which was given on pages 134–135 of the 1968–69 volume.



(F73) CIRCUIT DIAGRAM—DANSETTE "REGINA"

DECCA "Capri"

General Description: Record player with five transistors. Circuit features include negative feedback and transformerless output stage.

List of Resistors

Ref.			*Tol.*	*Ref.*			*Tol.*
R1	22kΩ ¼W 9 AP2	Erie	10%	R9	56Ω ¼W 9 AP2	Erie	10%
R2	18kΩ ¼W 9 AP2	Erie	10%	R10	820Ω ¼W 9 AP2	Erie	10%
R3	180Ω ¼W 9 AP2	Erie	10%	R11	5·6Ω ¼W 9 AP2	Erie	10%
R4	10kΩ ¼W 9 AP2	Erie	10%	VR1	1 M Log Radiohm P20		—
R5	2·2kΩ ¼W 9 AP2	Erie	10%	VR2	1 M Log with D.P.S.T. switch		—
R6	15kΩ ¼W 9 AP2	Erie	10%				
R7	3·9kΩ ¼W 9 AP2	Erie	10%	R12	470kΩ ¼W 9 AP2	Erie	10%
R8	1kΩ ¼W 9 AP2	Erie	10%	VR3	2MΩ Log Pot		—

List of Capacitors:

Ref.			*Tol.*	*Ref.*			*Tol.*
C1	125 MFD	16 V.W.	—	C7	400 MFD	16 V.W.	—
C2	0·1 MFD	125 V.W.	10%	C8	4700 pf	Tub. Cer.	20%
C3	500 MFD	6 V.W.	—	C9	—	—	—
C4	125 MFD	4 V.W.	—	C10	1000 MFD	30 V.W.	—
C5	400 pf	Tub. Cer.	10%	C11	1000 MFD	30 V.W.	—
C6	120 pf	Tub. Cer.	10%	C12	400 pf	Tub. Cer.	10%

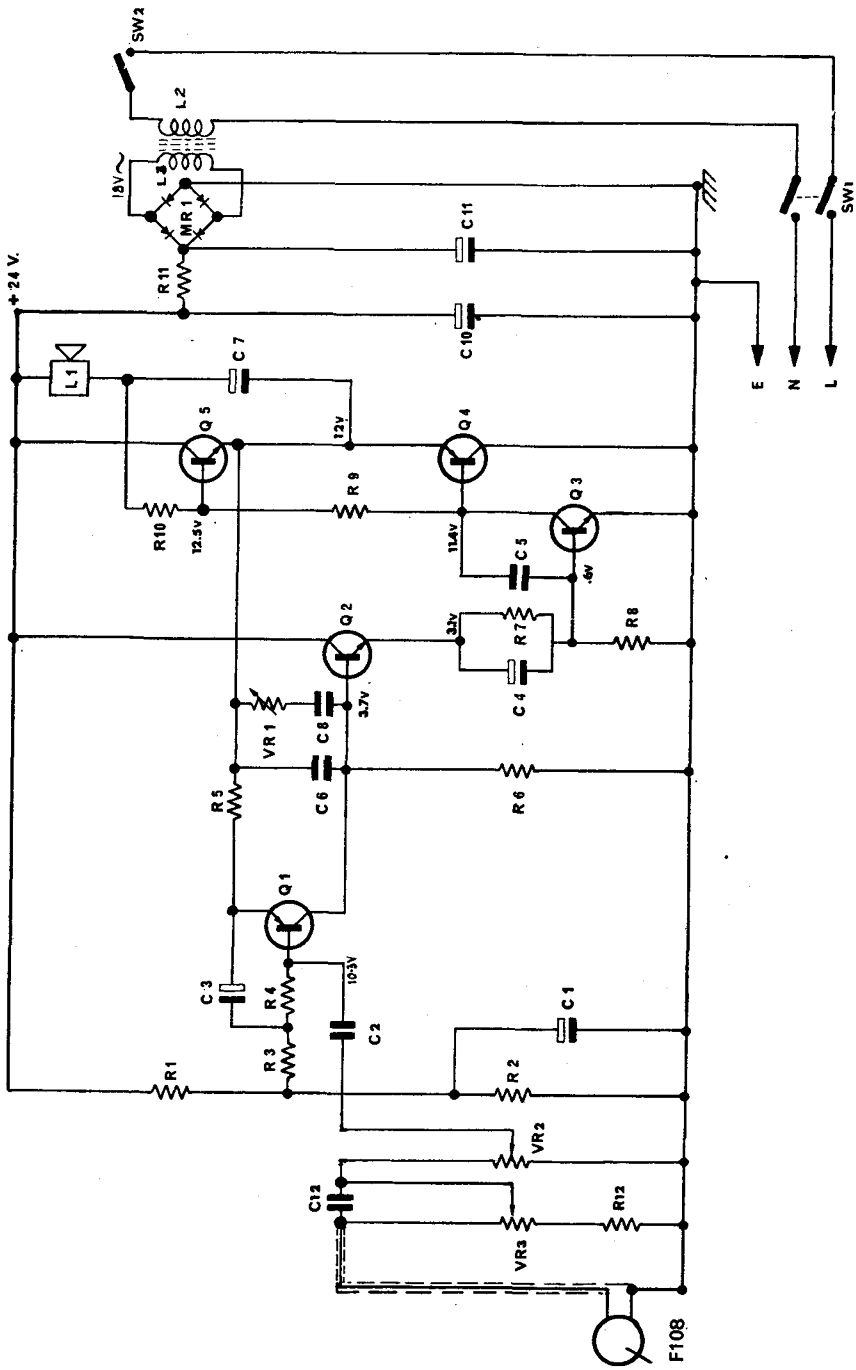
Parts List—Miscellaneous

Ref.		*Ref.*	
Q1	U17220 } SPA 4 Kit	L2	Player motor primary
Q2	U17721 } SPA 4 Kit	L3	18V overwound secondary
Q3	U17722 } SPA 4 Kit	MR1	G 63D/1 rectifier
Q4	U17723 } SPA 4 Kit	SW1	Mains off/on ganged to VR2
Q5	U17724 } SPA 4 Kit	SW2	Player auto stop switch
L1	25Ω VC Imp.		

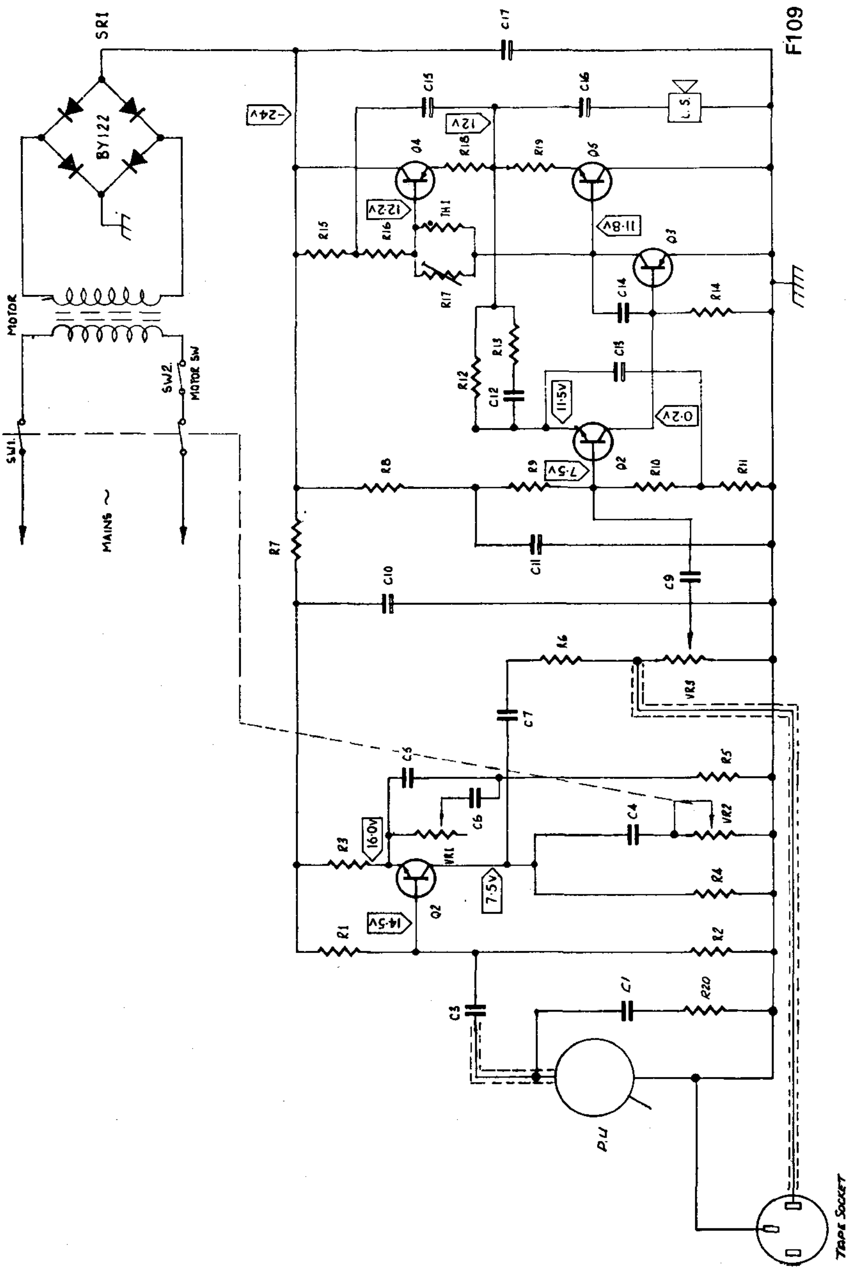
Circuit Diagram: The "Capri" circuit is illustrated overleaf.

DECCA "Majorca"

General Description: Record player with five transistors. Record changer, Garrard model 2025. Stylii, GP91/1SC stylus pack. Mains supply, 200/240 V A.C. 50Hz. Power output, 3 W.



(Fig. 108) Circuit Diagram—Decca "Capri"



(F109) CIRCUIT DIAGRAM—DECCA "MAJORCA"

Tape Socket: A tape socket is provided for tape-in and tape-out. In each case a standard mini-jack plug should be used (3·5 mm—long shank). The amplifier presents an impedance of about 20 K to the tape recorder. When feeding into a tape recorder the recorder should present an impedance of 20 K to the record player. The tape socket gives out about 100 mV, and should receive about 100 mV.

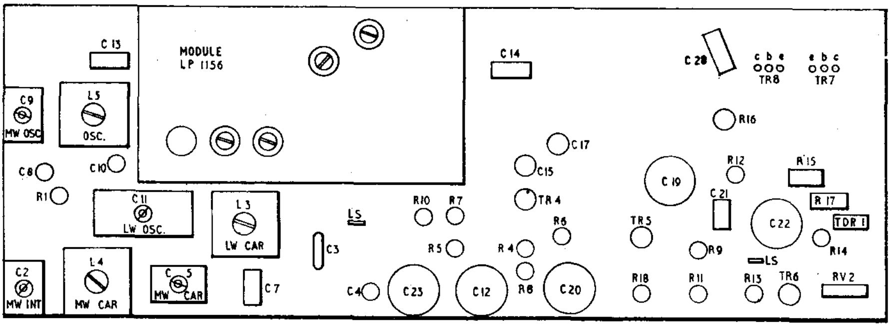
List of Resistors, Capacitors, Transistors, etc.

Ref.	*Resistors*	*Ref.*	*Capacitors*	*Ref.*	*Transistors, etc.*
R1	150 K	C1	0·04	Q1	BC 268
R2	1 M	C2		Q2	BC 268
R3	10 K	C3	0·1	Q3	AC 142
R4	56 K	C4	0·0047	Q4	AC 142K
R5	1·5 K	C5	0·1	Q5	AC 141K
R6	68 K	C6	40 μFD		
R7	33 K	C7	0·047		
R8	39 K	C8		TH1	VA1077 Thermistor
R9	390 K	C9	0·22		
R10	270 K	C10	170 μFD	VR1	20 K R/Log
R11	15 Ω	C11	50 μFD	VR2	100 K Log
R12	1·5 K	C12	0·47	VR3	50 K Lin
R13	680 Ω	C13	160 μFD		
R14	390 Ω	C14	B20	SR1	Silicon rectifier BY122
R15	100 Ω	C15	40 μFD		
R16	330 Ω	C16	400 μFD	SW1	On/off switch linked with treble control
R17	100 Ω Pre-set	C17	2000 μFD	SW2	Motor switch
R18	2·2 Ω				
R19	2·2 Ω			SKT1	Tape socket (view looking from top)
R20	1·2 K			PU	Pick-up

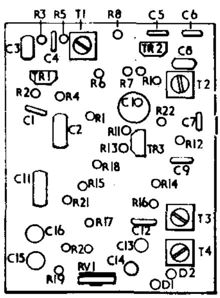
DYNATRON "Elan"—Models TP38 and TP39

General Description: The "Elan" is a thirteen-transistor battery operated portable radio receiver covering V.H.F., Medium and Long Wavebands. A telescopic aerial is provided for V.H.F. reception and the ferrite aerial system for medium and long wave reception may be switched off by push button and separate tuning circuits selected for car aerial connection. An external aerial may also be attached for V.H.F. reception if required. Batteries: two 9 V batteries type PP9 are supplied with the receiver. Aerials: telescopic for V.H.F. Ferrite 8-in. for medium and long wave. (Car aerial input for standard car aerial installation.) Wavebands: V.H.F.: 87–108 MHz., M.W. 185–570 metres (1620–525 kHz), L.W. 1100–2000 metres (270–150 kHz). Output: 1 W into 25 Ω.

Chassis Removal: Remove battery connectors, then remove push on tags to earphone socket. Take off connections to external aerial socket and afterwards remove cross-head screws from each end of dial scale. The complete chassis can then be removed through top of cabinet.



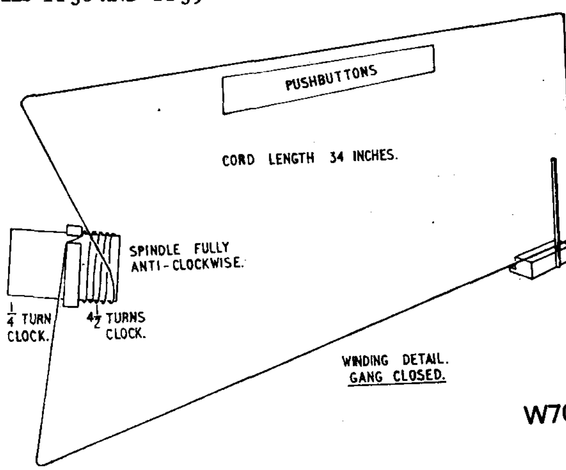
W68



W69

Top: (W68) Component Layout (Mains Chassis)

Left: (W69) Component Layout (V.H.F./I.F. Stages)—Models TP38 and TP39



W70

(W70) Drive Cord—
Models TP38 and TP39

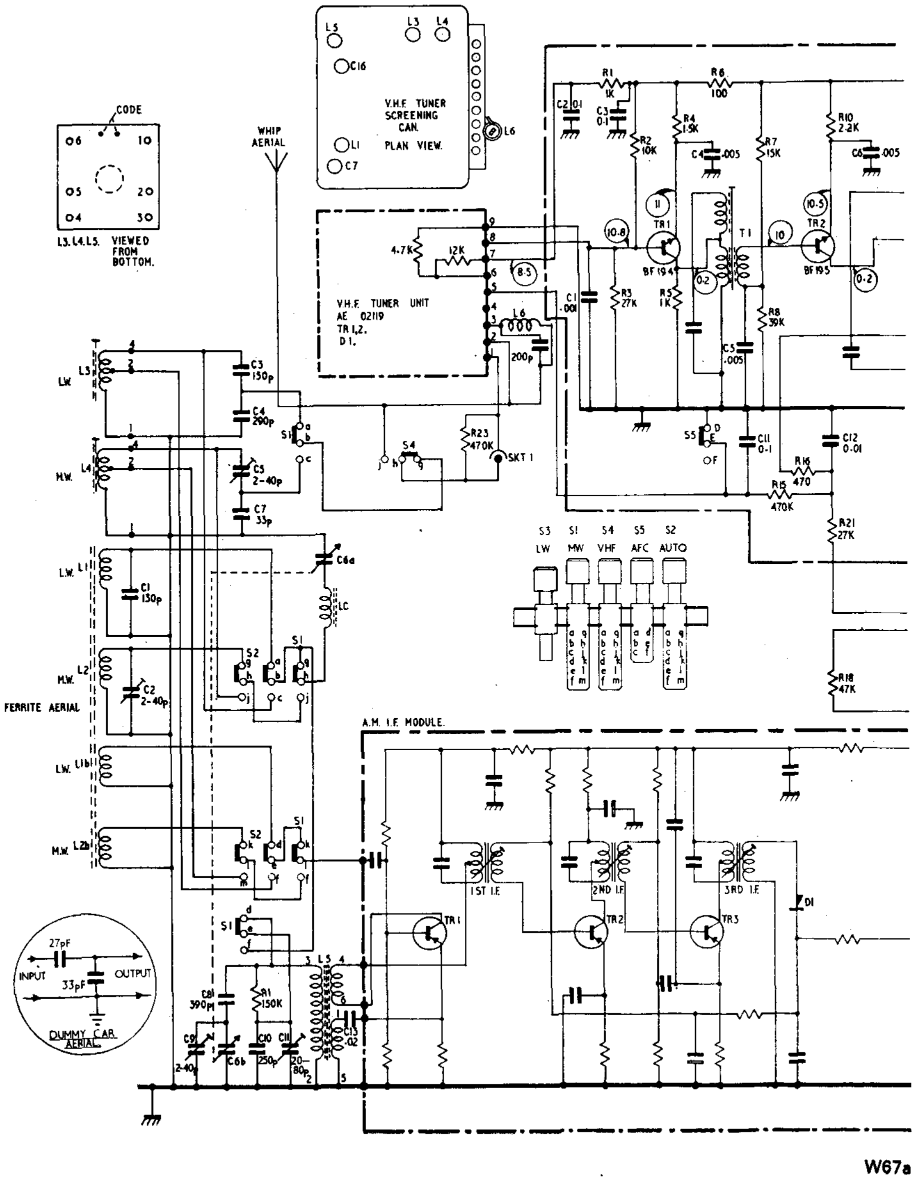
Quiescent Current—TR7 and TR8: Open TR7 collector connection and insert 10mA range meter. With volume at *minimum* adjust RV2 for 4mA indication. Remove meter, seal RV2 and reconnect TR7 collector.

Note: Check "mid point" volts at TR7 emitter = 9V (with 18V batteries).

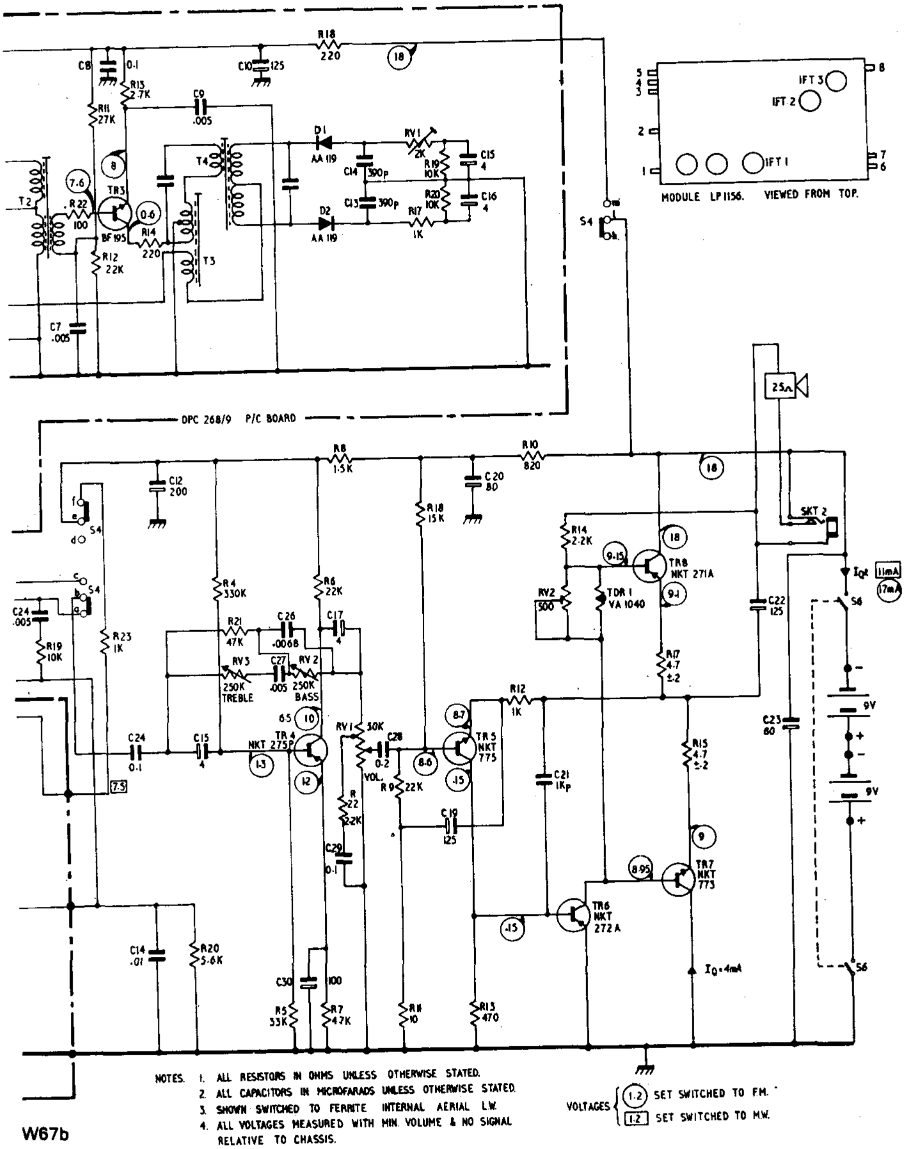
Static Voltage Measurements: These voltages are shown on circuit diagram measured with Avo 8.

Alignment (I.F. 470kHz): The frequency changer and I.F. amplifiers are contained in a pre-tuned module which will not require adjustment. In the event of a component failure, including transistors, the module should be returned to Dynatron spares department for replacement. When a replacement is fitted to a receiver the first I.F. transformer should be peaked for optimum gain. *Only this adjustment should be made.*

Alignment (A.M.R.F.): Check pointer coincides with end of scale aperture when gang is closed. Align circuits as follows:



(W67a) Circuit Diagram—Models TP38 and TP39 (Part)



NOTES. 1. ALL RESISTORS IN OHMS UNLESS OTHERWISE STATED.
2. ALL CAPACITORS IN MICROFARADS UNLESS OTHERWISE STATED.
3. SHOWN SWITCHED TO FERRITE INTERNAL AERIAL L.W.
4. ALL VOLTAGES MEASURED WITH MIN. VOLUME & NO SIGNAL RELATIVE TO CHASSIS.

VOLTAGES (1.2) SET SWITCHED TO F.M.
[1.2] SET SWITCHED TO M.W.

(W67b) CIRCUIT DIAGRAM—MODELS TP38 AND TP39 (CONTINUED)

(*a*) *Medium Wave using Ferrite Rod Aerial:* Inject signals from generator using a coupling loop. 1. Close gang and adjust L5 to receive 525kHz input signal. 2. Open gang and adjust C9 to receive 1630kHz input signal. 3. Set input signal to loop at 560kHz, tune receiver to signal and adjust L2 on rod for maximum output. 4. Set input signal to loop at 1500kHz, tune receiver and adjust C2 for maximum output. 5. Repeat 3 and 4 for optimum.

(*b*) *Long Wave using Ferrite Rod Aerial:* 1. Switch to L.W. and tune to 1600 metres on dial. 2. Set input signal to loop at 187kHz and tune C11 for signal. 3. Adjust L1 on ferrite rod for maximum output. 4. Check calibration and tracking on M.W. and L.W. using known stations.

(*c*) *Medium Wave using Car Aerial Coils:* Inject signals from generator using a dummy aerial (as shown on circuit diagram) into car aerial socket. 1. Depress "M.W." and "Car" push buttons. 2. Set input signal to 560kHz and tune to signal. Adjust L4 for maximum output. 3. Set input signal to 1500kHz and tune to signal. Adjust C5 for maximum output.
4. Repeat 2 and 3 for optimum.

(*d*) *Long Wave using Car Aerial Coils:* 1. Switch to L.W. and feed in 187kHz and tune to signal. 2. Adjust L3 to give maximum output.

Note: M.W. trimmer C5 may need adjustment for optimum performance on a particular car aerial installation if cable capacitance is high. In this case tune a station at H.F. end of band and trim C5 for maximum signal.

Alignment (I.F. 10·7MHz): 1. Connect wobbulator at 10·7MHz to input at C1-Base TR1. Output for display is taken from junction C12 R16. 2. Adjust T3 for maximum output and set T4 for correctly centred "S" curve. 3. Adjust T2 for maximum output, reducing input so that only a small curve is displayed to give greater accuracy in setting. 4. Adjust T1 for maximum sensitivity. 5. Repeat 2, 3 and 4 for maximum sensitivity and correctly centred "S" curve with $\pm$100kHz band width. 6. Connect wobbulator to V.H.F. aerial input and remove core from filter coil L6. 7. Adjust V.H.F. unit I.F. cores L3 and L4 for maximum sensitivity with good "S" curve. Not that T1 may need slight adjustment. 8. Set R.F. coil core L1 to be level with top of former and adjust R.F. trim capacitor C7 to give maximum output. 9. Insert core into filter coil L6 and adjust for minimum output.

V.H.F. Calibration: A.F.C. button should be "out". 1. Set pointer to 88MHz and inject 88 MHz signal from sig. generator (with 22·5kHz deviation) into aerial socket. 2. Adjust L5 for signal. 3. Set generator to 108MHz and tune set to H.F. end of scale. Adjust C16 for signal. 4. Repeat 2 and 3 until tracking correct.

V.H.F. Alignment: 1. Set generator to 90MHz and tune receiver to signal. 2. Connect Avo 8 (10V D.C.) to gang frame and junction D1 and RV1. 3. Tune set for maximum voltage reading. Reduce input to approximately 0·75V. 4. Adjust C7 for maximum voltage reading.

A.M. Rejection: 1. Use Avo connected as above as tuning indicator and tune very accurately to the signal generator. Remove Avo connections. 2. Switch generator to A.M. at 30 per cent modulation. 3. Adjust RV1 for minimum output. Seal RV1.

A.F.C. Action: 1. Reconnect Avo as indicator and tune receiver accurately. Adjust input to give 1 V reading on Avo. A.F.C. button "out". 2. Detune receiver to H.F. side for Avo reading of 0·6 volt. 3. Press A.F.C. button and observe that voltage rises to 0·8 V approximately. Release button. 4. Detune receiver to L.F. side and repeat. Observe symmetry.

DYNATRON — Models TP40 and TP41

General Description: These models are similar to the Dynatron models TP38 and TP39 but do not have the F.M. sections. The servicing data for the TP38 on the preceding pages may be referred to, with that exception.

EKCO — Model CR946

General Description: This car radio is similar to the Pye Model 2041, which is described on later pages in this section of this volume.

EKCO — Model PT306

General Description: This receiver is similar to the Pye Model 1374 which is described later in this volume.

EKCO — Model PT307

General Description: This model is similar to the Pye Model 1369, which is described on page 340 of the 1968–69 volume.

EKCO — Model PT308

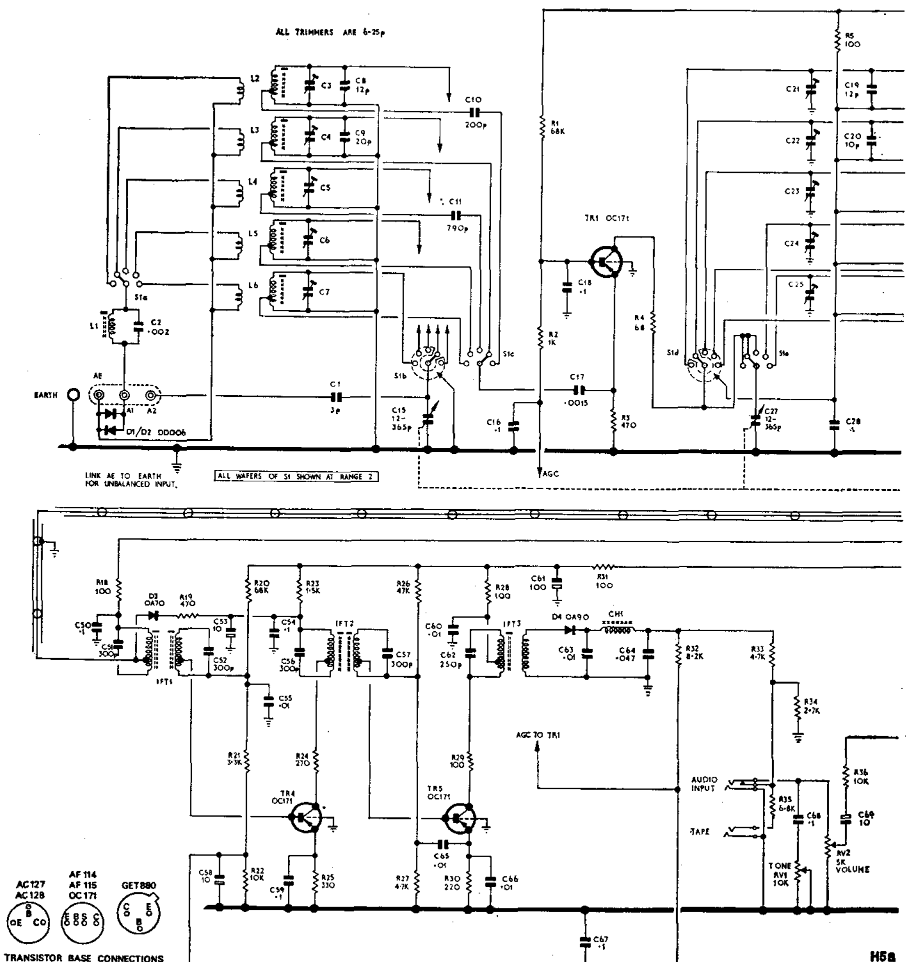
General Description: Apart from presentation, this model is similar to Model PTP 301, which is described on page 171 of the 1968–69 volume.

EDDYSTONE Model EB36

General Description: Fully transistorised receiver based on the EC10 receiver (see 1967–68 volume), and similar in some respects to the EB35 receiver described in the 1968–69 volume.

Frequency Coverage: Ranges 1–5, same as EB35.

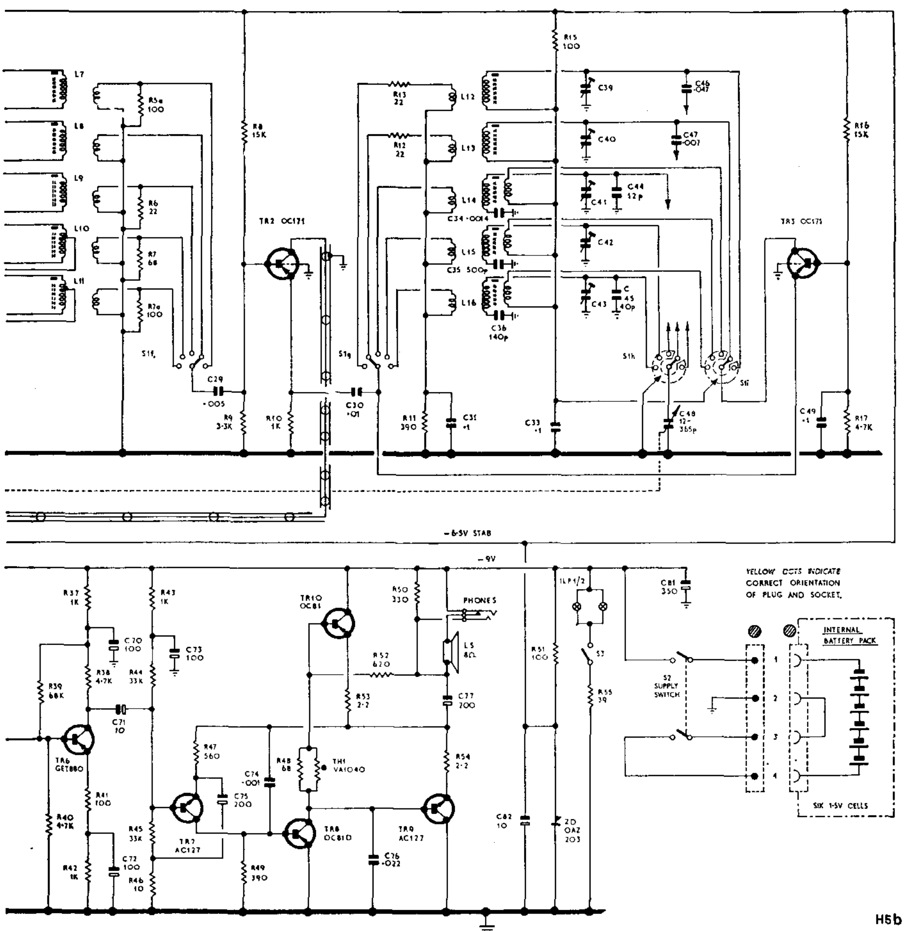
Alignment: Sensitivity figures quoted in the instructions that follow are based on the assumption that the battery pack is delivering 9 V. All dust cores and trimmers are self-locking.



(H5a) Circuit Diagram—Model EB36 (Part)

Test Equipment Required: Signal generator(s) covering the intermediate frequency of 465 kc/s and the signal frequency ranges 150–305 kc/s and 550 kc/s–30 Mc/s. Output impedance 50/75 Ω, modulation 30 per cent at 400 c/s. Modulated crystal-controlled harmonic-generator providing 100 kc/s markers up to 7·5 Mc/s and 1 Mc/s markers up to 22 Mc/s. Output meter matched to 8 Ω with plug to mate with telephone socket on panel.

Trimming Tools: Miniature insulated screwdriver with $\frac{1}{16}$-in. blade, small metal-tipped insulated screwdriver and a Neosid Type H.S.1. hexagonal core adjuster.



(H5b) Circuit Diagram—Model EB36 (Continued)

Re-alignment of the I.F. Stages: First locate and remove the four screws holding the two angle strips on which the I.F. printed wiring board is mounted. Rotate the board through 90 degrees and temporarily secure in this position using two of the screws just removed. Access to both ends of the I.F. transformers is now possible and the receiver can be placed on its left-hand side-plate to permit connection of the generator output lead to the range 5 mixer coil L11 (see underside view of receiver). Generator output impedance should be arranged to match 50 Ω, the earthy lead being clipped to the screen adjacent to the coil. Short out the forward section of the tuning gang (C48) to disable the local oscillator and connect the output meter to the telephone socket on the panel. The speaker circuit is interrupted by insertion of the plug and the meter will therefore indicate true output power. Switch on the generator, allow it adequate time to stabilise against drift and set the receiver controls as follows: range switch, range 5; volume, maximum; tuning, 350kc/s; tone, fully c/wise. Tune the signal generator to 465kc/s (with modulation 30 per cent at 400c/s) and then set the attenuator to give a reading of approximately 50mW on the output meter. Peak the cores in IFT1, IFT2 and IFT3 for maximum output remembering that the first two transformers are double-tuned and the final transformer has a single core only. All cores should be set to the "outer" peak, each adjustment being repeated several times to ensure accurate alignment.

On completion of the adjustments detailed above, re-set the attenuator for an output reading of 50mW and check that the overall I.F. sensitivity is of the order 4μV. If the gain appears to be on the low side, commence investigation by taking sensitivity readings from the bases of TR4 and TR5. The live generator lead must be blocked with a capacitor of some 0·05μF while making this check which should reveal sensitivities of the order 35μV and 1mV respectively for an output of 50mW.

A low reading from the base of TR5 almost certainly indicates a fault in the audio section of the receiver. The appropriate stages can be tested by introducing a 100-c/s signal via the audio input socket at the rear. An input of approximately 5mV should produce 50mW output.

Once the I.F. alignment has been completed, disconnect the generator(s) and output meter, remove the shorting link from C48 and refit the I.F. board in its normal position.

R.F. Alignment: The first step in this part of the alignment procedure is a check on the overal calibration accuracy. Proceed as follows:

Connect the output of the harmonic generator to the "A1" and "AE" sockets with the shorting link in place between the "AE" socket and the **earth** terminal. Set the generator to provide modulated 1 Mc/s markers and then tune across the whole of Range 1, checking the scale accuracy at each mc/s point. Accuracy should be within 1 per cent (i.e. 200kc/s at 20Mc/s, 100kc/s at 10Mc/s, 20kc/s at 2Mc/s, etc.). Re-alignment of the local oscillator circuits should be considered necessary only if the error observed is greater than this.

Repeat the check on Range 2 and then select Range 3. The 100kc/s markers can be introduced on this range to permit checking at 500kc/s intervals. On Ranges 4 and 5, check each 100kc/s point.

Errors in excess of 1 per cent on any range should be rectified by carrying out normal tracking procedure, taking care to repeat all adjustments several times to nullify interaction between the appropriate trimmer and core. Alignment frequencies and adjustments are given in Table 1.

(H6) PLAN VIEW—
MODEL EB36

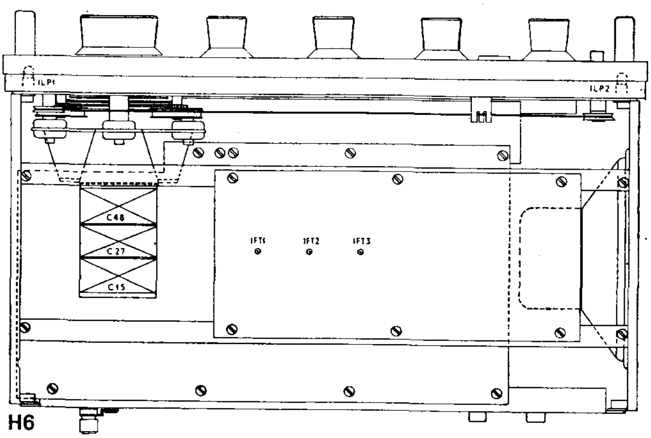


TABLE 1. *Oscillator alignment frequencies and adjustments*

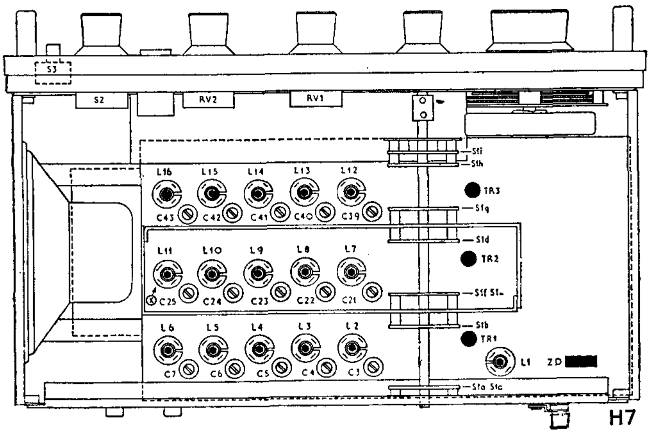
Range	*Frequency*	*Trimmer*	*Frequency*	*Core*
1	20·0Mc/s	C39	8·0Mc/s	L12
2	8·0Mc/s	C40	3·6Mc/s	L13
3	3·5Mc/s	C41	1·5Mc/s	L14
4	1400kc/s	C42	550kc/s	L15
5	330kc/s	C43	160kc/s	L16

On completion of any realignment of the local oscillator circuits, disconnect the harmonic generator and connect the signal generator in its place prior to commencing realignment of the R.F. aerial and mixer circuits. The generator output impedance should be arranged to match 75 Ω when aligning Ranges 1–3 and 400 Ω for Ranges 4 and 5. Modulation should be set to 30 per cent at 400 c/s and the output meter should be connected to the telephone socket as during I.F. alignment.

Adjustments are made at the same frequencies employed for oscillator alignment but using the trimmers and cores listed in Table 2. As with oscillator alignment, each adjustment should be repeated several times to cancel the inevitable interaction between trimmer and core. The aerial input circuits should be adjusted for best signal/noise ratio.

TABLE 2. *RF/mixer alignment frequencies and adjustments*

Range	*Trimmer*			*Core*		
	Frequency	*Aerial*	*Mixer*	*Frequency*	*Aerial*	*Mixer*
1	20·0Mc/s	C3	C21	8·6Mc/s	L2	L7
2	8·0Mc/s	C4	C22	3·6Mc/s	L3	L8
3	3·5Mc/s	C5	C23	1·5Mc/s	L4	L9
4	1400kc/s	C6	C24	550kc/s	L5	L10
5	330kc/s	C7	C25	160kc/s	L6	L11



(H7) UNDERSIDE VIEW —MODEL EB36

Note: Connect generator to tag "X" on L11 when carrying out I.F. alignment.

The I.F. rejector coil L1 should be adjusted when aligning Range 4, the procedure being as follows:

Tune the receiver to 550kc/s (low frequency alignment point) and the generator to the intermediate frequency of 465kc/s. Increase output from the generator until an indication is obtained on the output meter. Adjust the rejector coil for *minimum* signal. Re-tune the generator to 550kc/s reduce its output and check the adjustment of L5 for *maximum* signal. Repeat both checks to ensure accurate alignment of the two circuits.

Finally, carry out a check on the overall sensitivity at the mid-band frequency on each range. With the generator properly matched sensitivities of the order 5μV or better should be realised on the three higher frequency ranges. On Ranges 4 and 5 the sensitivity is a little lower being in the region of 15μV or better. All sensitivities are quoted for a signal/noise ratio of 15dB and an output of 50mW in 8Ω.

Aerials: See data for model EB35.

Drive Cord: Same as model EB35.

Batteries: Dial lamps and cabinet removal similar to model EB35.

Mains Operation: The receiver can be operated directly from all standard A.C. mains supplies by fitting a Power Unit Type 924 in place of the battery

container. The P.U. gives an output of 9 V and has the same physical size and fixing arrangements as the normal battery box. An instruction sheet is supplied with the power unit which can be ordered through your local stockist. Specify for use with EB36 receiver when ordering.

Connecting Telephones or an External Loudspeaker: The "PHONES" socket on the panel of the receiver can be used either for connection of telephones for personal listening or an external loudspeaker which can, if required, be located some distance from the receiver.

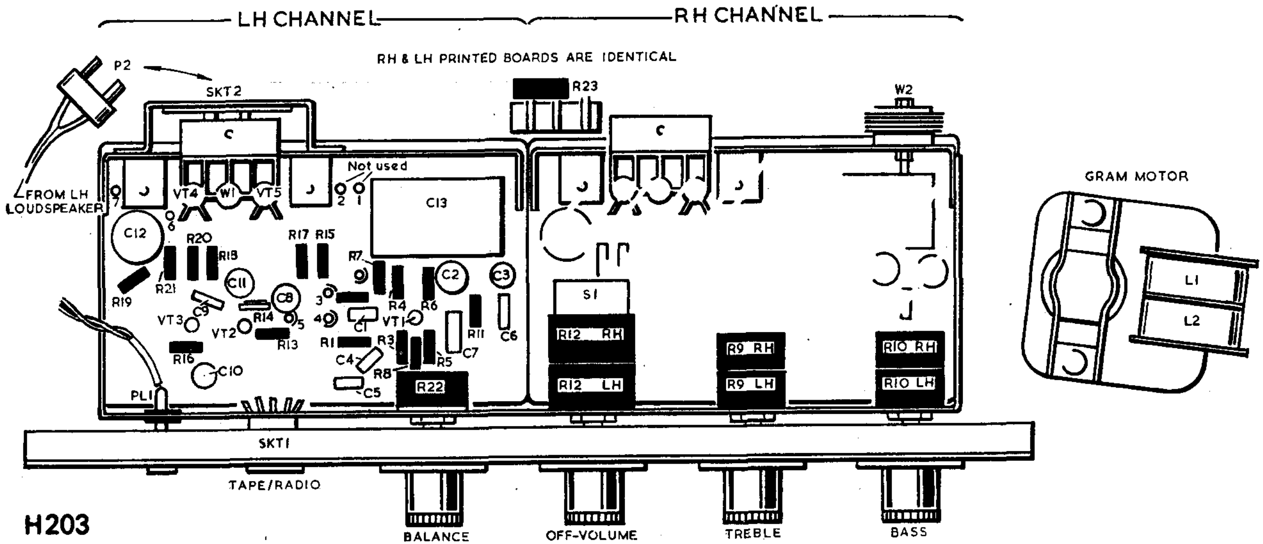
Connection to a Tape Recorder or Hi-Fi Amplifier: The socket labelled "TAPE" at the rear of the set can be used to extract a low-level signal for connection to a tape recorder or hi-fi system. A suitable plug is supplied with the receiver and this should be used to terminate a screened cable to feed the external unit. The braid of the cable should be soldered to the neck of the plug shell and the inner wire to the pin.

Using the Receiver as an Audio Amplifier: A second plug is supplied for use when employing the audio stages of the receiver as an amplifier in conjunction with a microphone, gramophone pick-up or tape-replay-head. The socket for this facility is marked "A.F. INPUT" and is arranged to cut out normal signals when the plug is inserted.

Voltage Analysis: Typical voltage readings for each stage are given in the table which follows. All readings were taken under no-signal conditions on Range 5 using a testmeter with a sensitivity of 20,000 ohms/volts. All readings are negative W.R.T. earth and a tolerance of 20 per cent should be allowed.

Reference	*Collector volts*	*Base volts*	*Emitter volts*
TR1	6·1	0·95	0·65
TR2	6·3	1·25	1·3
TR3	6·1	1·5	1·5
TR4	5·0	1·15	0·95
TR5	8·0	0·7	0·45
TR6	6·4	0·5	0·45
TR7	0·16	4·2	4·6
TR8	4·7	0·16	—
TR9	—	4·8	4·9
TR10	9·0	5·0	4·9

Circuit Modifications: TR8 and TR10 are Mullard AC128.



H203

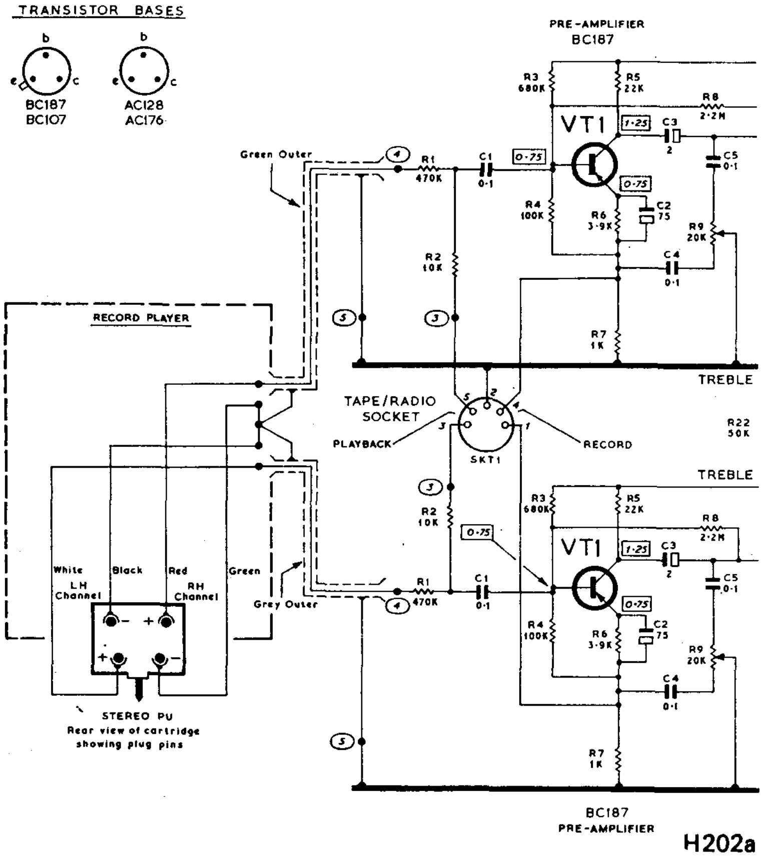
(H203) COMPONENT LOCATIONS—MODEL 3024 (SCH. B)

Component Differences

Resistors			Capacitors				Transistors and Diodes		
Ref.	*Value*	*Function*	*Ref.*	*Value*	*Rating*	*Function*	*Ref.*	*Description*	*Type No*
R6	3·9KΩ	VT1 emitter stabilizing	C7	0·22 μF	100 V	Part bass control	VT1	Pre-amplifier	BC187
R11	1·2KΩ	Part bass control network	C9	1000 pF	400 V	VT2 base bias decoupling	VT2	A.F. amplifier	AC128
R13	10KΩ	Part VT2 base bias pot.					VT3	Driver	BC107
R15	3·3KΩ	VT1 supply line decoupling					W1	Stabilizing diode	AA129

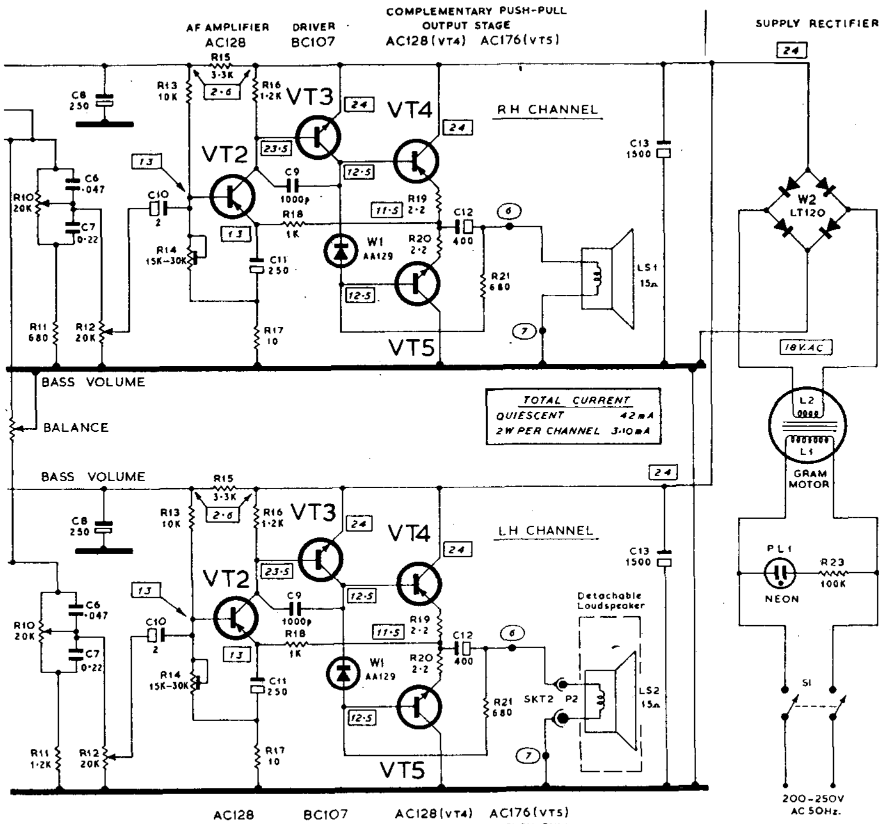
FERGUSON Model 3024 (Sch.B)

General Description: Stereo record player with record changer BSR UA50. Circuit changes affecting components were made in later production models (designated Schedule B). These models are identified by a tubular tone arm fitted to record changer unit.



(H202a) Circuit Diagram—Model 3024 (Sch.B) (Part)

The component diagram is shown opposite, together with a list of differences. The circuit diagram is continued overleaf.



H202b

(H202b) Circuit Diagram—Model 3024 (Sch.B) (Continued)

FERGUSON Model 3022 (Sch.B)

General Description: This model is basically similar to the Ultra model 6024, which is described in this volume.

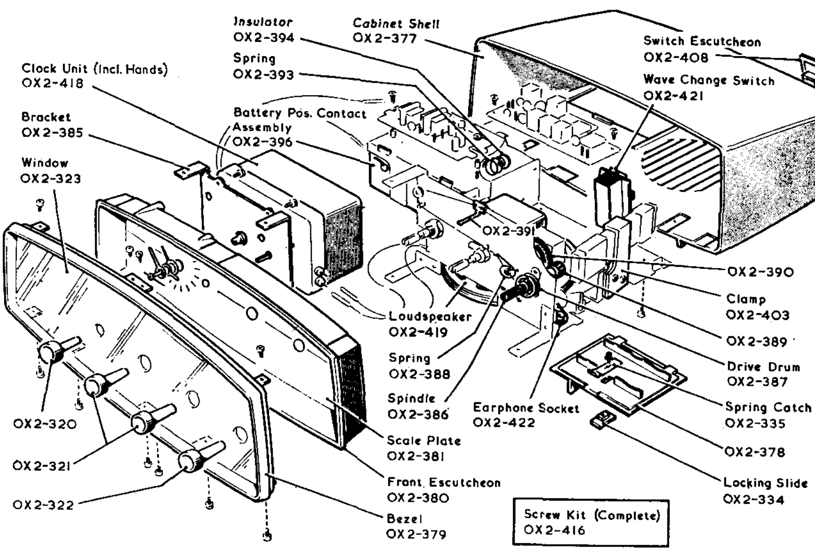
FERGUSON Model 3026

General Description: This model is basically similar to the H.M.V. model 2040, which is described on later pages of this volume.

FERGUSON Model 3163

General Description: Radio receiver with clock. Power output, 140mW. Loudspeaker: round, 8Ω. Earphone socket: 8Ω minimum, a magnetic type (private listening) earphone is supplied with receiver. Batteries: two 1·5V cells (HP11) for radio, and one 1·5V cell (HP11) for clock. M.W.: 180–575 metres. L.W.: 810–2150 metres.

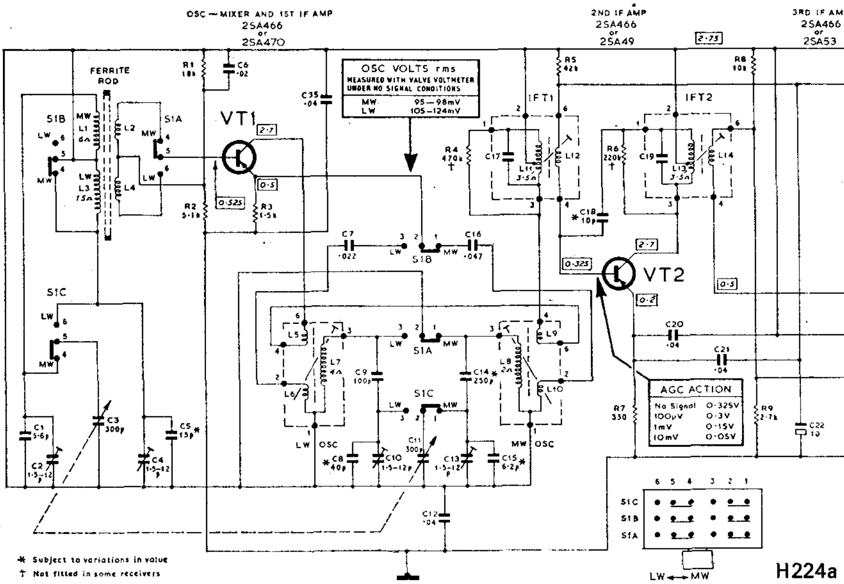
Clock: Runs from separate 1·5V battery and can be pre-set to switch the radio on at any desired time after which the radio plays for approximately one hour before switching off automatically. The clock regulator is accessible through the base of the receiver.



(H226) Exploded View—Model 3163

Access for Service: To release the receiver from the case first remove battery compartment cover and extract batteries, then remove the four screws from underside of case and withdraw the complete receiver. For access to the drive cord, etc., the chassis assembly can be separated from the bezel and clock assembly as follows: Rotate the tuning control to line up the cursor with a slot at the end of the scale aperture. Pull off the on–off–auto, volume and tuning knobs. Remove four screws securing the controls mounting panel to the bezel and unplug the four clock leads. Further dismantling details including removal of clock unit are shown in diagram H226.

Note: Before reassembling the bezel and chassis assembly ensure that the cursor is lined up with one of the slots at the ends of the scale aperture. When



(H224a) Circuit Diagram—Model 3163 (Part)

refitting the receiver into the case ensure that the flange at the rear of the battery compartment engages the slots in the case moulding.

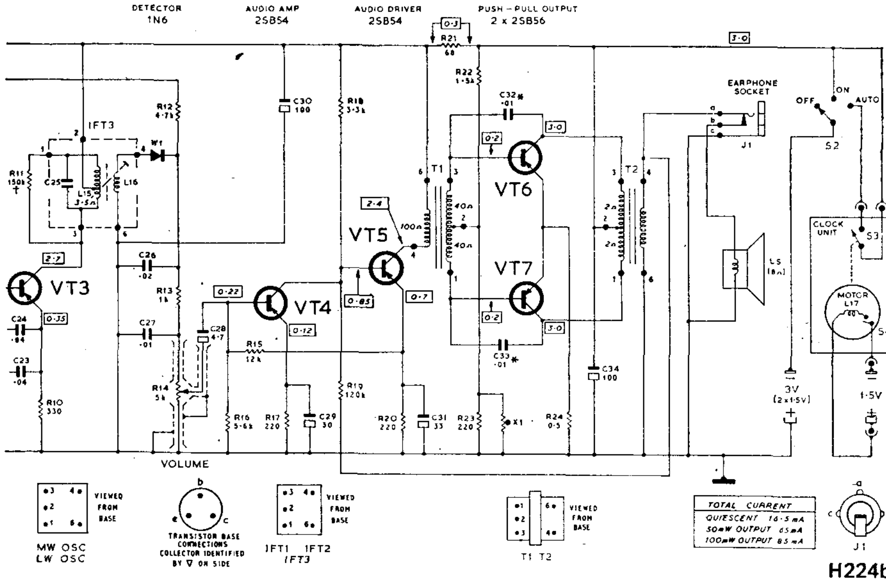
Clock Movement: The movement, which is driven by a 1·5 V cell via an electric motor and spring, runs for approximately six months on one HP11 battery. The motor is automatically switched on at intervals of two minutes (approximately) to wind up the drive spring. No servicing should be attempted apart from adjusting the regulator which is accessible through an aperture in the underside of casing. In the event of any fault developing in the clock movement it should be returned to the nearest service depot. The four leads to the clock casing are pluggable and the clockhands can be eased off the concentric drive sleeves. Care should be exercised to avoid damage to the clock hands.

When refitting the clock hands proceed as follows: 1. Turn the alarm spindle in a clockwise direction until a "click" is heard. 2. Refit all hands in the "12 o'clock" position in order shown in diagram H226.

Circuit Diagram Notes: Voltages shown in rectangles were taken with a 20,000 ohms/volt meter with respect to the positive line except where otherwise shown.

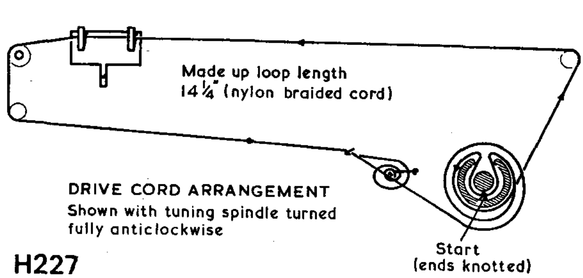
Note: The positive line is connected to chassis metalwork but the I.F. and oscillator screening cans are connected to the decoupled negative rail. D.C. resistance readings are shown against inductors where these are 1 Ω or greater.

Key to Aerial Coil Leads M.W.: L1—Black and Pink; L2—Yellow and Green
L.W.: L3—Black and White; L4—Yellow and Green

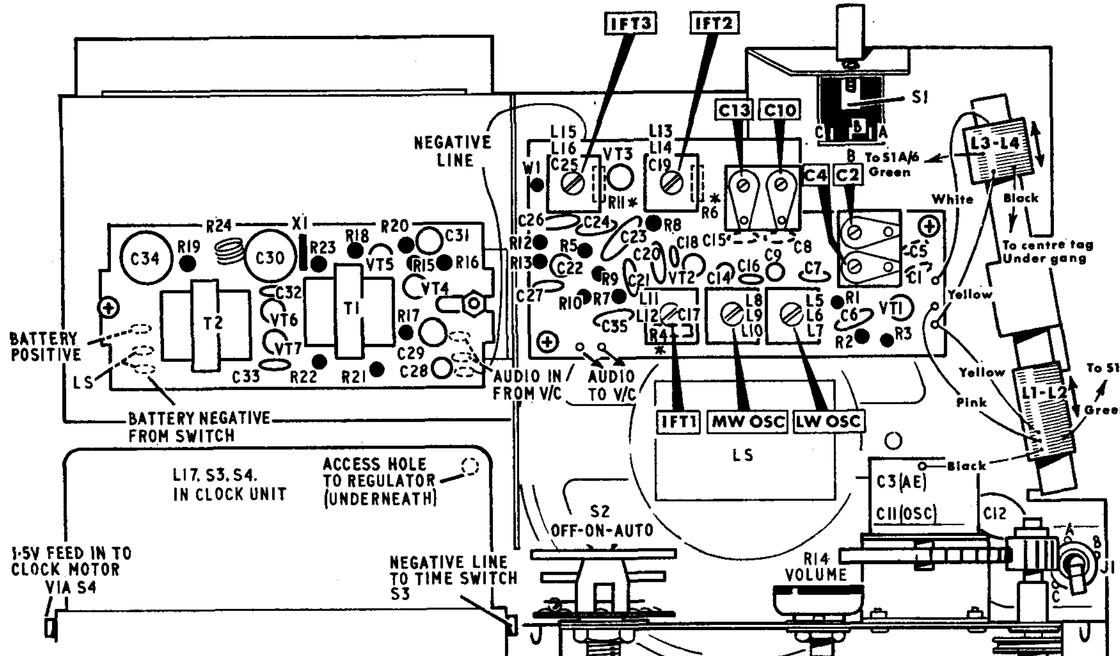


(H224b) Circuit Diagram—Model 3163 (Continued)

Alignment: A signal from a suitable signal generator 30 per cent amplitude modulated by an A.F. signal is required for circuit alignment. Tuning indication is best obtained with an output meter, having an impedance of 8 Ω, connected in place of the loudspeaker. The earphone jack tags A and C provide convenient connecting points once the spring contact has been isolated. Alternatively connect an Avometer Model 8, set to the 2·5V A.C. range, in parallel with the loudspeaker—tags B and C of the earphone jack provide suitable connecting points. Throughout the procedure the signal input level should be adjusted to maintain the audio output at approximately 50 mW, with volume control at maximum, to avoid alignment error due to AGC action.



(H227) Drive Cord—Model 3163



* R4, R6, AND R11 NOT FITTED IN SOME RECEIVERS

H225

(H225) COMPONENT LOCATIONS AND ALIGNMENT POINTS—MODEL 3163

I.F. Circuits: Switch to M.W. and turn gang to maximum (500 metres end of waveband). Inject 475 kHz signal via a 0·1 μF capacitor across C3 (aerial section of gang); connect between the tag nearest the ferrite aerial on the underside of the gang and the single tag at the top of the gang which is the earth return. Adjust IFT3 (L15/L16), IFT2 (L13/L14) and IFT1 (L11/L12) in that order for maximum output. Repeat until no further improvement is obtainable.

R.F. Circuits: Inject signals via a loop loosely coupled to the ferrite bar aerial. Before commencing check, and if necessary adjust, the cursor so that it travels into the slot at either end of cursor aperture. Adjust for maximum in the order shown in the following tables.

Range	*Inject*	*Cursor Position*	*Adjust*
M.W.	600 kHz	500 metres	L8/L10 L1/L2*
	1500 kHz	200 metres	C13 C2
L.W.	150 kHz	2000 metres	L6/L7 L3/L4*
	250 kHz	1000 metres	C10 C4

Repeat all adjustments until no further improvement results.
* Adjust by sliding coils along ferrite bar.

FERGUSON Model 3164

General Description: Radio receiver with 300 mW power output. Aerials: ferrite rod for M.W. and L.W., telescopic rod for S.W. Sockets: car aerial and earphone (or tape recorder). Battery: 9 V (PP9). Loudspeaker: round, 15 Ω.

Wavebands: L.W.: 1120–2050 metres. M.W.: 185–565 metres. S.W.: 17·6–51 metres.

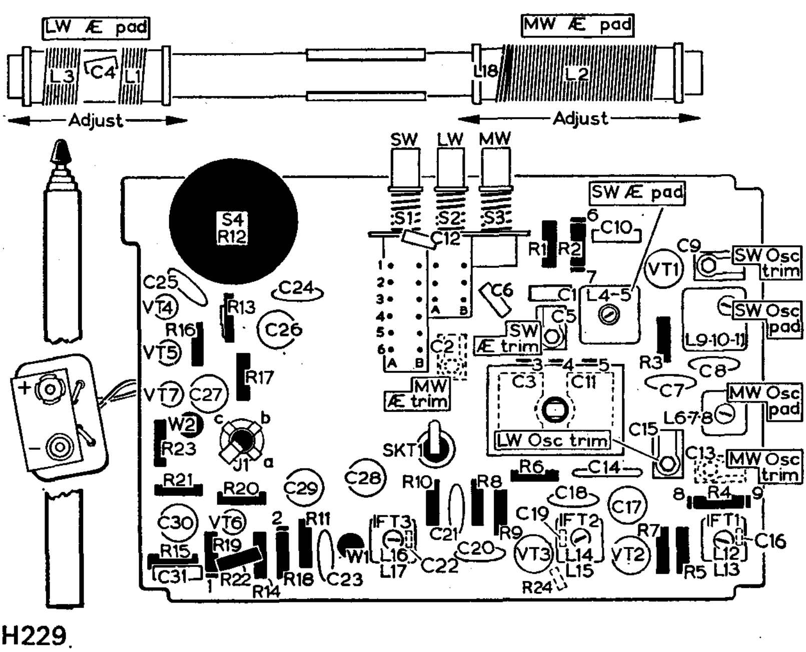
Access for Service: Slide battery cover downwards to release it and remove battery. Pull off tuning knob and unscrew handle fixing studs to free back cover. For access to copper side of printed board, remove one screw and washer then gently prise up lower end of board, clipped into moulded lugs on case.

Circuit Notes (Complementary Power Output Stage): PNP and NPN type transistors are used in conjunction with a stabilizing diode to provide a transformerless power stage giving an audio output of 300 mW.

The audio signal developed across volume control R12 is applied via coupling capacitor C25 to the base of audio amplifier transistor VT4. The amplified signal appearing at the collector of VT4 is directly coupled to the base of driver transistor VT5. The output from VT5 simultaneously drives the bases of both output transistors VT6 and VT7. During positive half-cycles of the signal, NPN transistor (VT7) conducts, resulting in a fall in collector/emitter voltage of VT7. During negative half-cycles of the signal PNP transistor (VT6) conducts, resulting in an increase in collector/emitter voltage of VT7. The loudspeaker is fed via C30 and J1.

VT5 collector load R19 is returned to the "live" side of the loudspeaker and, as this point is coupled to the emitters of VT6 and VT7 through C30, the input signal to the output stage is virtually applied between base and emitter of both VT6 and VT7.

The diode is biased by VT5 collector current and acts as a variable resistance which is sensitive to voltage and temperature variations. The resistance value of W2 is small compared with R19 and the voltage developed across W2 equals the sum of the nominal output transistor (VT6 and VT7) base/emitter voltages and so determines the correct quiescent operating conditions. During low ambient temperature conditions the resistance of W2 increases thus compensating for falling current of the output transistors. This effect also takes place in the event of falling battery voltage. The diode W2 also assists thermal



(H229) Component Locations and Alignment Points—Model 3164

stability at high temperatures and opposes high current drain from the battery.

Alignment: Connect an output meter, set to 15 Ω impedance, in place of loudspeaker. Alternatively, connect a Model 8 Avometer (on 10 V A.C. range) across speech coil.

Set volume control to maximum but, during alignment, adjust signal generator output level to maintain receiver output at 50 mW.

(*a*) *I.F. Circuits:* Switch receiver to M.W. and turn gang to maximum capacitance. Apply a 475 kHz (30 per cent modulated) signal, via a 0·1 μF blocking capacitor, across C3 (aerial section of gang) then adjust IFT3, IFT2 and IFT1 (in that order) for maximum output. Repeat until no further improvement results.

(*b*) *R.F. Circuits:* Inject M.W. and L.W. signals via a loop loosely coupled to ferrite rod aerial. Align in following order.

Range	*Signal Gen.*	*Tune to*	*Adjust for max.*	
M.W.	525 kHz	Gang fully closed	L8 (M.W. osc. pad)	Repeat until no further improvement results.
M.W.	600 kHz	Gen. signal	L2* (M.W. aerial pad)	
	1500 kHz	Gen. signal	C2 (M.W. aerial trim)	
L.W.	148 kHz	Gang fully closed	C15 (L.W. osc. trim)	* Adjust by sliding coil former along ferrite rod.
	220 kHz	Gen. signal	L3* (L.W. aerial pad)	

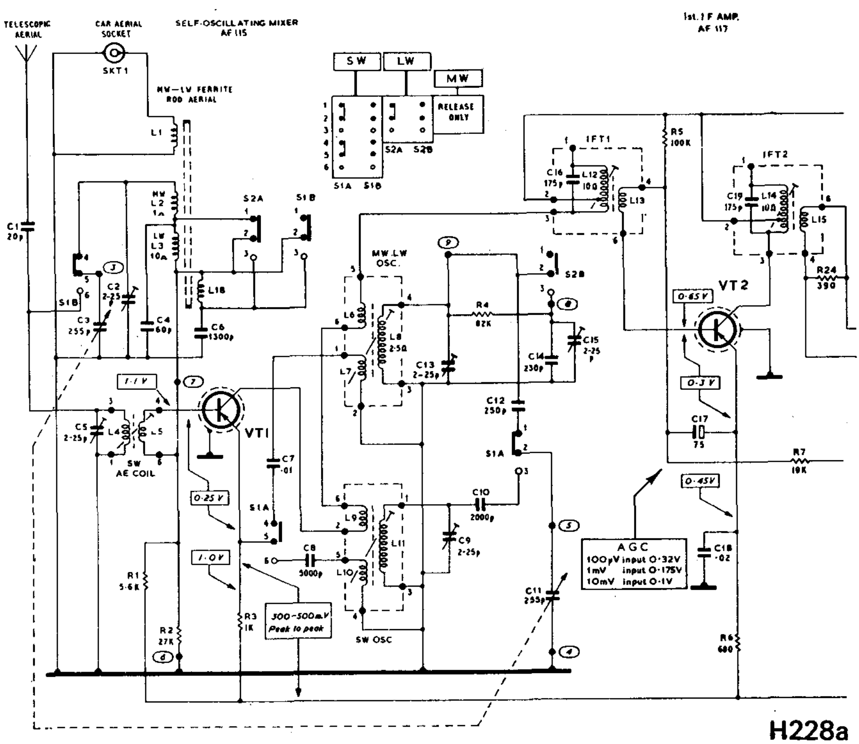
(*c*) *Short Wave:* Extend telescopic aerial and place signal generator lead near by to provide a loose coupling.

Range	*Signal Gen.*	*Tune to*	*Adjust for max.*	
S.W.	5·9 MHz	Gang fully closed	L11 (S.W. osc. pad)	Repeat until no further improvement results.
	17 MHz	Gang fully open	C9 (S.W. osc. trim)	
	6·77 MHz	Gen. signal	L4 (S.W. aerial pad)	
	15·45 MHz	Gen. signal	C5 (S.W. aerial trim)	

Balance Adjustment: Output transistors VT6 and VT7 are series connected across the 9 V battery supply and to ensure a balanced supply voltage to each, an adjustment R13 is incorporated in emitter circuit of VT4. Adjustment of this resistor sets emitter potential and hence collector potential of VT4. It will, therefore, determine the base potential of driver VT5 which is directly coupled to VT4. This bias decides collector potential of VT5 which in turn controls base voltages of VT6 and VT7.

Correct balance is obtained when potential of VT6/VT7 emitter junction is 5 V with respect to positive line. The discrepancy from half-battery voltage is due to the emitter bias voltage developed across R17 which determines limit of negative signal excursion before bottoming of VT5 takes place.

An alternative method of balancing operating voltages of VT6 and VT7 is by visual observation, on an oscilloscope, of output waveform at maximum

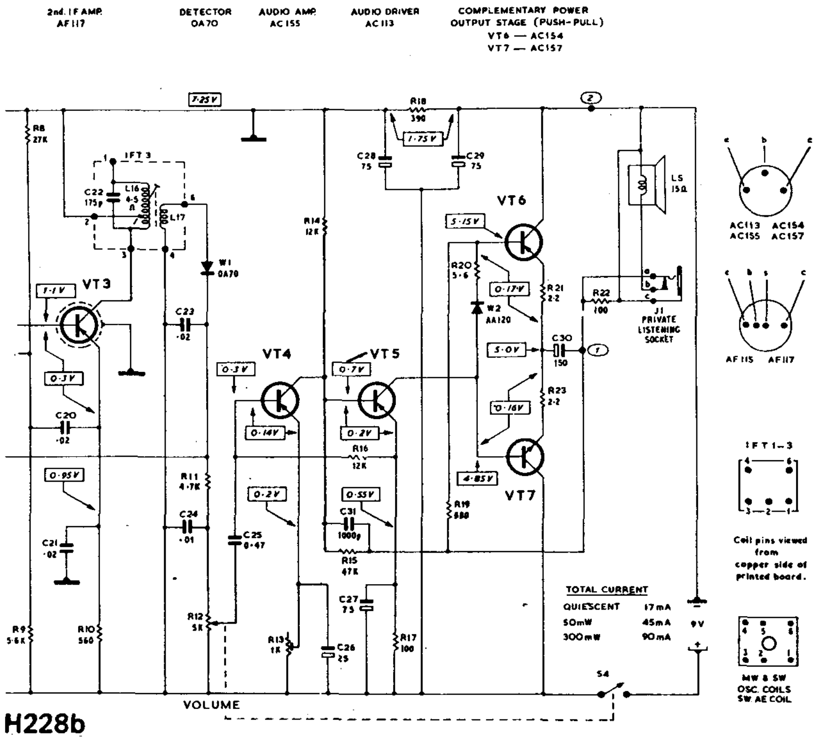


(H228a) Circuit Diagram—Model 3164 (Part)

output when adjustment should be made for symmetry of both waveform and clipping at high outputs.

Tag Connections: 1. To J1, contact "a". 2. to J1, contact "c". 3. From gang section C3 to switch S1B, contact 5. 4. From gang common "earth" to tag 6, to aerial socket SKT1 (outer) and also to C6. 5. From gang section C11 to switch S1A, contact 2. 6. To tag 4 and also to junction of C4, L1 on ferrite rod. 7. To switch S2A, contact 2. 8. To switch S2B, contact 3. 9. To switch S2B, contact 2.

Circuit Diagram Notes: 1. Figures in rectangles indicate voltages measured with a 20,000 ohms/volt meter between positive line and point shown, except where otherwise indicated. 2. D.C. resistance readings are shown against inductors, where these are 1 ohm or greater. 3. Ringed figures show printed board tag connecting points. Circuit shown with medium wave button depressed. R13 is adjusted to give 5.0V at junction of R21, C30.



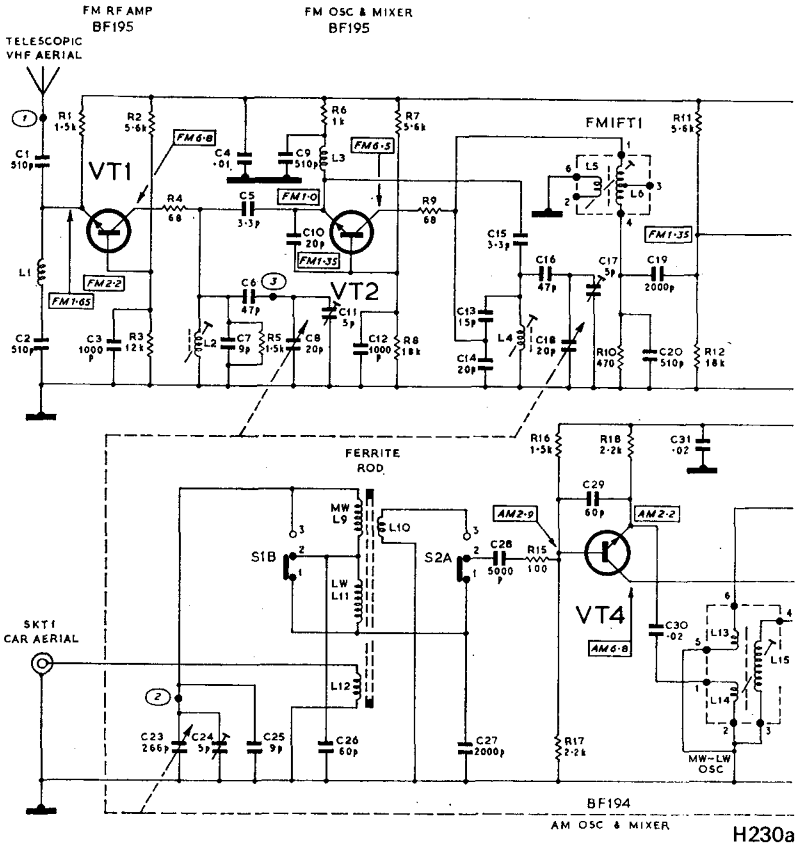
(H228b) Circuit Diagram—Model 3164 (Continued)

FERGUSON Model 3165

General Description: Radio receiver with an output power of 300mW. Aerials: ferrite rod for A.M. and telescopic rod for F.M. Sockets: private listening (30–100Ω) and car aerial. Loudspeaker: round, 15Ω. Battery: 9V (PP7).

Wavebands: L.W.: 1120–2025 metres. M.W.: 185–565 metres. V.H.F.: 87·5–100MHz.

Dismantling for Service: Pull off tuning knob. Release battery cover and take out battery, then unscrew handle studs to release handle, taking care not to lose spring washers. The two halves of the cabinet should now be opened out at the push-button end and separated by lifting the front half out of the retain-

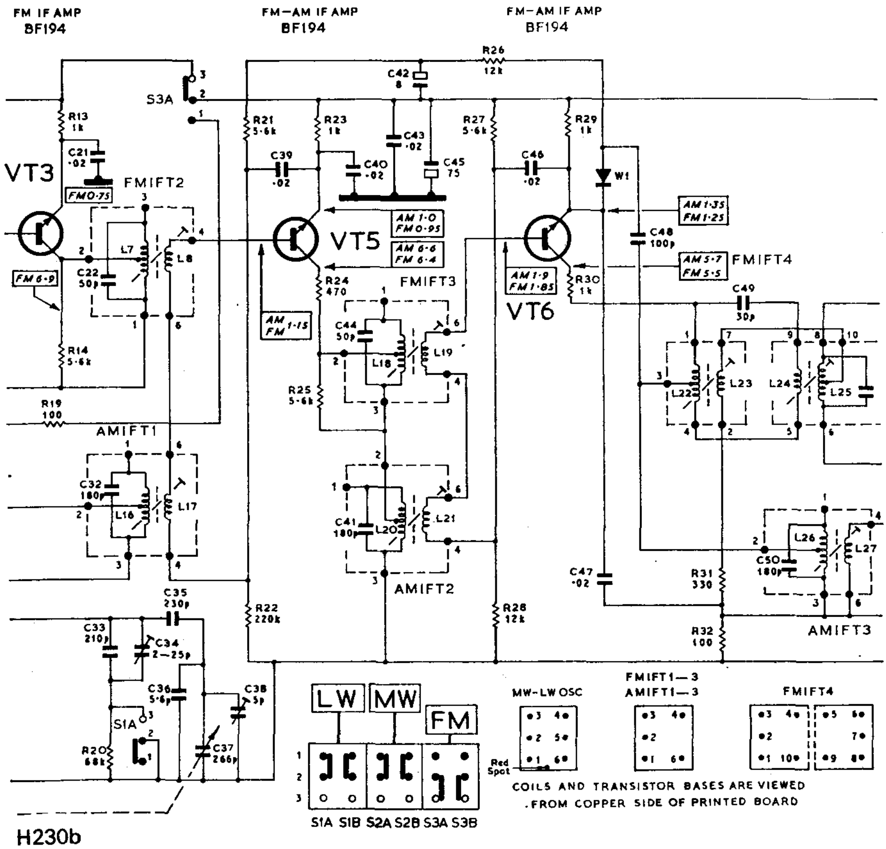


(H230a) Circuit Diagram—Model 3165 (Part)

ing slots in the lower end of the back section. To release the printed board, take out screw from base of telescopic aerial and withdraw aerial from cabinet; remove two screws from socket end of board then slacken and rotate board clamp to enable board to be withdrawn.

Alignment (General): A signal from a suitable A.M.–F.M. generator is required. Tuning indication is best obtained either with an output meter having an impedance of 15 Ω and connected in place of the loudspeaker or a Model 8 Avometer, set to the 10 V A.C. range, connected in parallel with the loudspeaker. Throughout alignment the signal input level to the receiver should be adjusted to maintain the audio output at approximately 50 mW with the volume control set at maximum in order to avoid alignment error due to A.G.C. action.

Alignment (A.M.I.F. Circuits): Select M.W. and turn gang to maximum

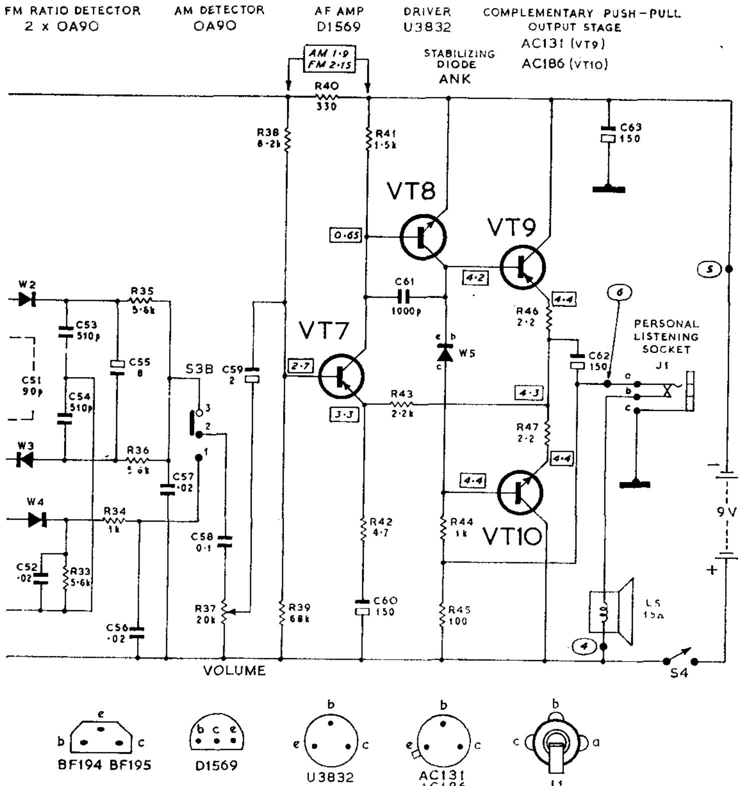


(H230b) Circuit Diagram—Model 3165 (Part)

capacitance. Apply a 475kHz modulated signal through a 0·1μF capacitor between tag 2 and frame of tuning gang. Adjust L26/27, L20/21 and L16/17 in that order for maximum output. Repeat in the same order until no further improvement is obtainable.

Alignment (A.M.R.F. Circuits): M.W. must be aligned first. Medium and long wave signals should be injected via a loop loosely coupled to the ferrite rod aerial. Set signal generator and cursor as indicated in the table and make all adjustments for maximum output.

Range	*Inject*	*Cursor Position*	*Adjust*	
M.W.	600kHz	Centre of 500 metres	L15, L9*	* Adjust by sliding coil former along ferrite rod.
	1500kHz	Centre of 200 metres	C38, C24	
L.W.	200kHz	Centre of 1500 metres	C34, L11*	



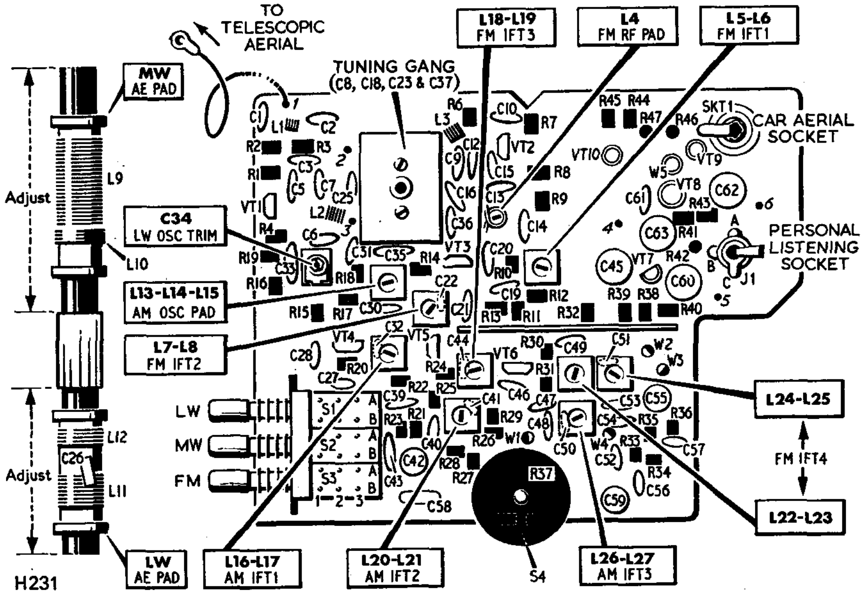
H230c

(H230c) CIRCUIT DIAGRAM—MODEL 3165 (CONTINUED)

Repeat adjustments as necessary to obtain maximum output and accurate calibration.

Alignment (F.M.I.F.): Select F.M. Inject 10·7MHz (25kHz deviation) signal, via a 0·1 μF blocking capacitor, between tag 3 and fame of tuning gang and peak L22/23, L18/19 and L7/8 for maximum output. Switch signal generator to A.M. (30 per cent modulation) and adjust L24/25 for minimum output (A.M. rejection). Repeat as necessary for maximum F.M. output and minimum A.M. output. Switch signal generator to F.M. and transfer input to junction of R6/C9. Peak L5/6 for maximum output.

Circuit Diagram Notes: All voltages were measured with a 20,000Ω/volt meter and are with respect to the negative supply line of each transistor except where otherwise shown. Ringed figures indicate printed board tag connection points. D.C. resistances of inductor are less than 1Ω with the following exception: L9—3.5Ω: L11—10Ω; L12—2Ω; L15—3Ω.



(H231) Component Locations and Alignment Points—Model 3165

Alignment (F.M.R.F.): Inject F.M.R.F. signals into telescopic aerial lead with aerial disconnected and make adjustments for maximum output.

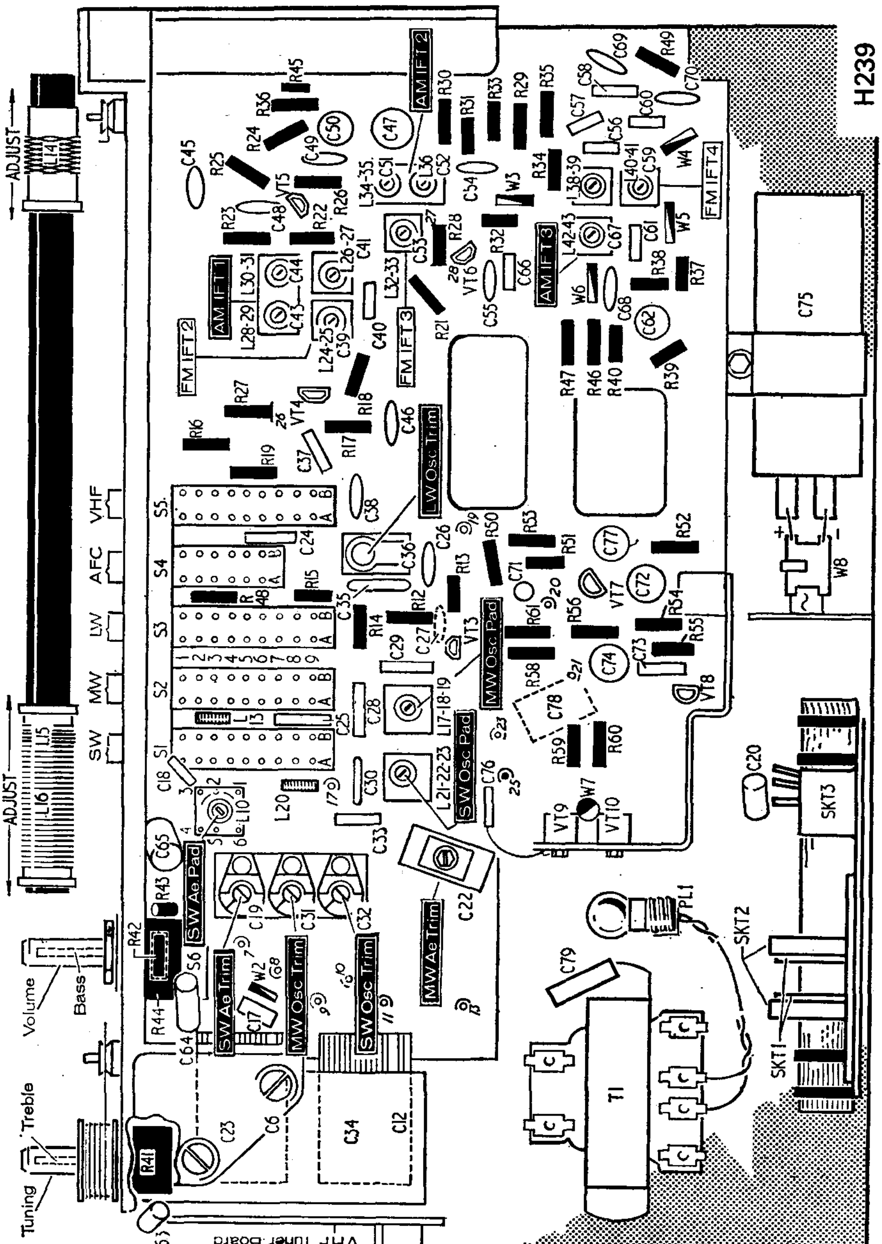
Range	*Inject*	*Tune to centre of*	*Adjust*	
F.M.	88 MHz 96 MHz	"A" in "Athlone" 96 MHz calibration	L4, L2* C17, C11	* Adjust by slightly opening or closing coil turns.

Repeat in the same order until no further improvement results.

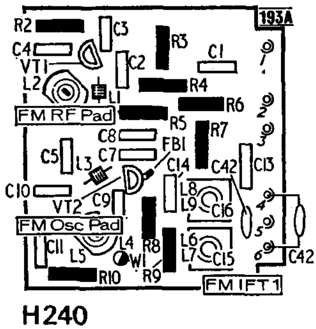
FERGUSON Model 3166

General Description: Radio receiver with 1·5 W output. Aerials: ferrite rod for M.W. and L.W., inbuilt mains type for V.H.F./F.M. Mains voltage range: 200–250 V A.C. 50 Hz. Loudspeaker: elliptical, 15 Ω. Sockets: A.M. aerial and earth, external F.M. aerial and 5-pin D.I.N. tape.

Access for Service: Pull off rotary control knobs using a length of stout cord, wound behind the knob, as a "puller". Unplug internal F.M. aerial lead and detach cabinet back (2 screws). Remove plastic nuts and S.P. washers to



(H239) CHASSIS LAYOUT—MODEL 3166



(H240) F.M. Tuner Board
—Model 3166

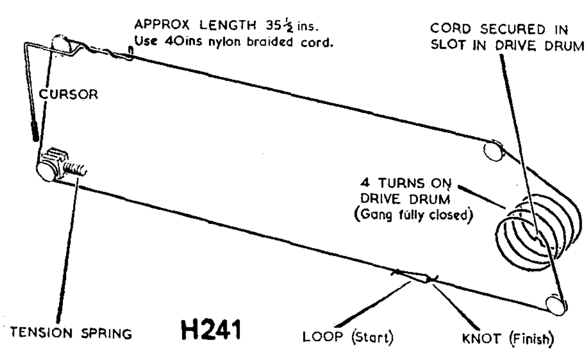
release chassis. The chassis and loudspeaker assembly can now be lifted clear of the cabinet.

When reassembling, do not omit to refit spacing rubbers on fixing screws between rear of chassis and cabinet floor.

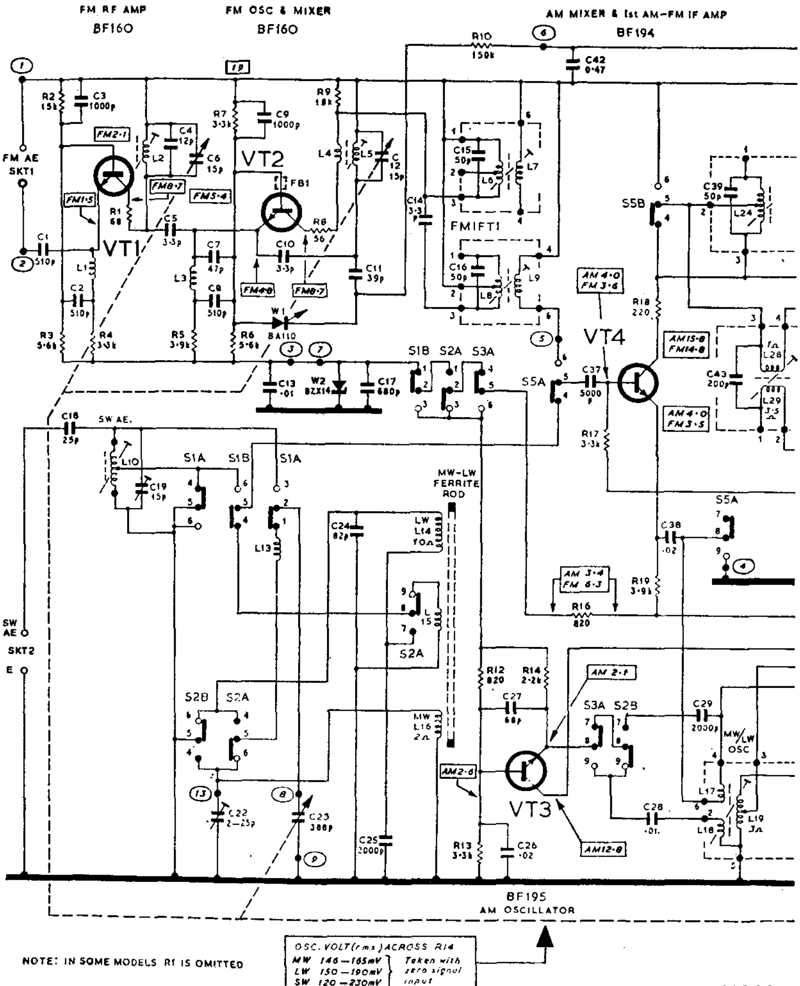
A.M. Alignment (General): A signal from a suitable A.M./F.M. generator is required for circuit alignment. Tuning indication is best obtained with an output meter having an impedance of 15 Ω connected in place of loudspeaker (across tags 23 and 21) or a Model 8 Avometer, set to the 2·5V A.C. range, connected in parallel with the loudspeaker. Throughout alignment the signal input level to the receiver should be adjusted to maintain the audio output at approximately 50 mW with bass, treble and volume controls set at maximum to avoid alignment error due to A.G.C. action.

Alignment (A.M.I.F.): Depress M.W. button and turn gang to maximum capacitance. Apply a 475 kHz signal (30 per cent modulated) though 0·1 μF capacitor across C23 (tags 8 and 9) aerial section of tuning gang. Adjust L42/L43, L36/L37, L34/L35, L30/L31 and L28/L29 in that order for maximum output. Repeat in the same order until no further improvement is obtainable.

Alignment (A.M.R.F.): With gang at maximum capacitance, check that cursor coincides with set zero pip at left-hand end of scale widow. Slide cursor along drive cord to correct any error in calibration. *M.W. must be aligned first.*



(H241) Drive Cord
—Model 3166

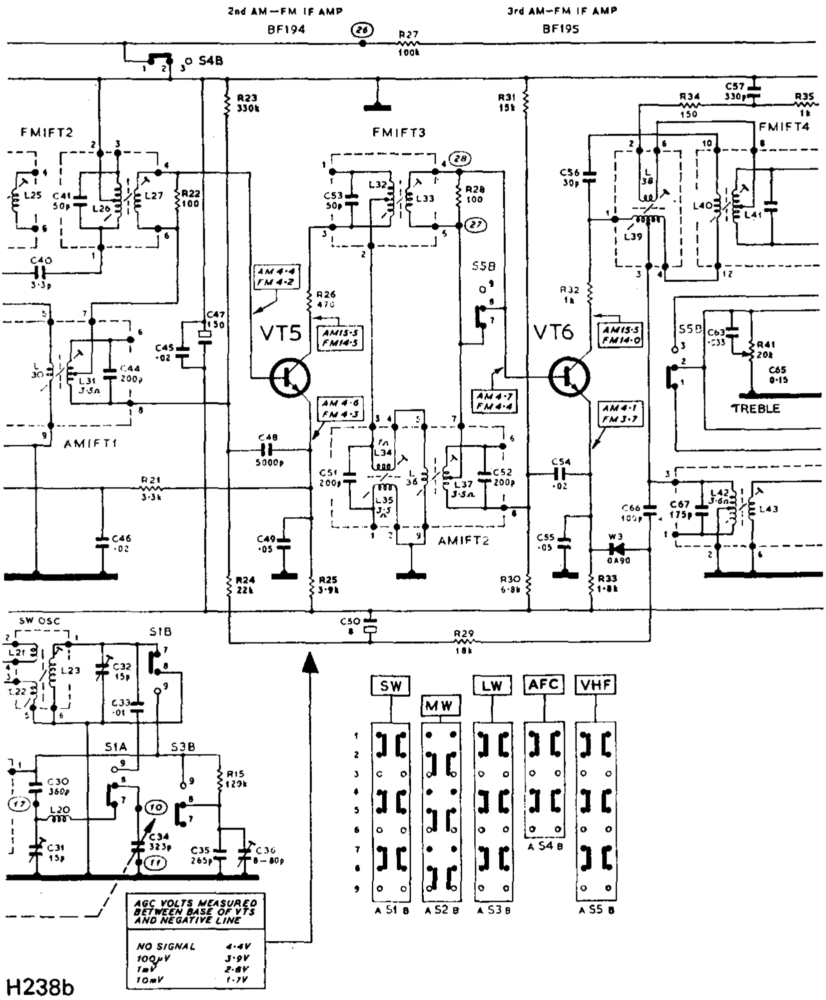


H238a

(H238a) Circuit Diagram—Model 3166 (Part)

Signals should be injected via a loop loosely coupled to the ferrite rod aerial. For S.W. alignment the telescopic aerial lead should be disconnected and signals injected to the lead via a 7–10pF capacitor.

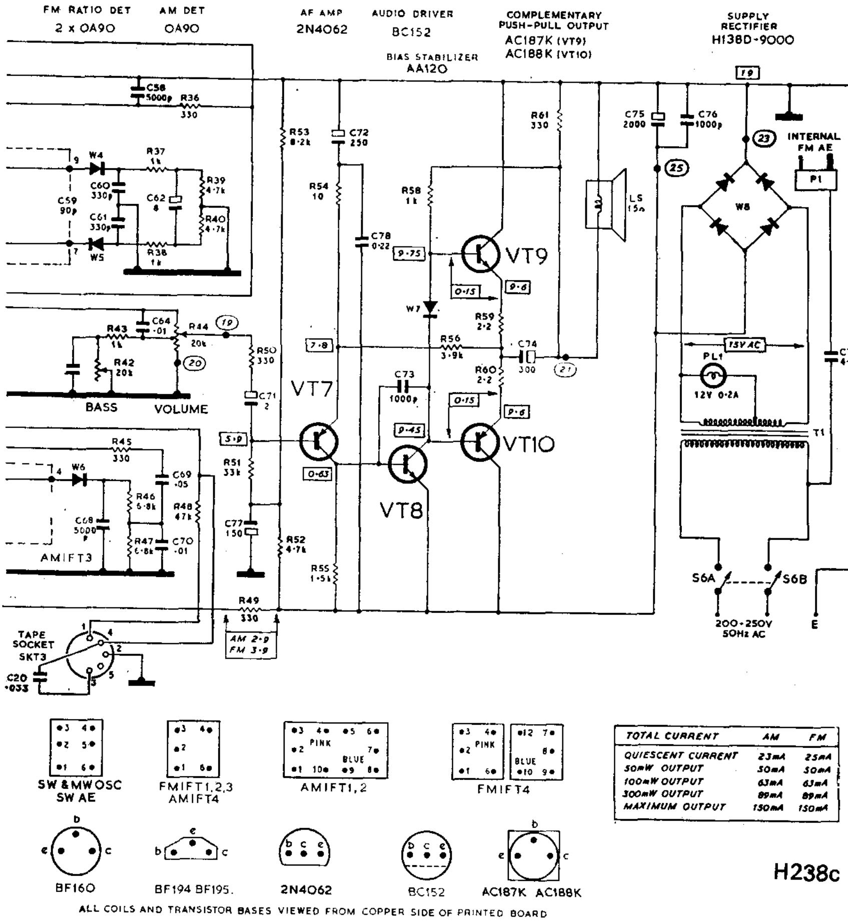
Circuit Diagram Notes: All voltages were measured with a 20,000Ω/volt meter and are with respect to the negative supply line of each transistor except where otherwise shown. Ringed figures indicate printed board tag connection points. D.C. resistance readings are shown against inductors where these are 1 Ω or greater.



(H238b) Circuit Diagram—Model 3166 (Part)

Range	*Inject*	*Cursor Position*	*Adjust*	
M.W.	600kHz 1500kHz	500 metres 200 metres	L19, L16* C31, C22	* Adjust by sliding coil along ferrite rod.
L.W.	220kHz	Calibration marker	C36, L14*	† "Pulling" which may occur whilst tuning C19, should be counteracted by "rocking" the gang.
S.W.	6·7MHz 15·8MHz	Pad marker Trim marker	L23, L10 C32, C19†	

Repeat all adjustments as necessary to obtain maximum output and accurate calibration.



TOTAL CURRENT	AM	FM
QUIESCENT CURRENT	23mA	25mA
50mW OUTPUT	50mA	50mA
100mW OUTPUT	63mA	63mA
300mW OUTPUT	89mA	89mA
MAXIMUM OUTPUT	150mA	150mA

(H238c) CIRCUIT DIAGRAM—MODEL 3166 (CONTINUED)

Alignment (F.M. Procedure): To obtain satisfactory operation of the A.F.C. it is essential that the disciminator circuit is adjusted to a balanced condition. This is achieved by measuring the voltage across R44. As the voltage swings alternately positive and negative a centre-zero meter (25-0-25 μA) with a series 22 KΩ resistor will provide a satisfactory means of measurement. The meter should read zero on completion of alignment. An Avo meter model 8 on the 50 μA D.C. range may be used but is not so satisfactory for following the positive and negative voltage swings, or for reading zero.

Alignment (F.M.I.F.): Connect centre-zero meter between tag 20 and pin 2 of S5B. Depress V.H.F. push-button and ensure that the A.F.C. push-button is in the "out" position. Inject a 10·7 MHz signal, 25 kHz deviation, via 0·1 μF capacitor between tag 5 and chassis. Adjust L38/L39, L32/L33, L26/L27, L/24/L25 and L8/L9 for maximum reading on output meter. Adjust L6/L7 for minimum reading on output meter and L40/L41 to read zero on centre-zero meter. Repeat all adjustments for optimum results consistent with zero on centre-zero meter with minimum noise or A.M. modulation.

A check of balance can be made by swinging signal generator either side of 10·7 MHz when centre-zero meter should show a similar deflection to positive and negative.

Alignment (F.M.R.F.): Leave centre-zero meter connected as for I.F. alignment. Depress V.H.F. push-button. Tune receiver to 92 MHz and inject 92 MHz (25 kHz deviation) to F.M. aerial socket (SKT1). Adjust L5 and L2 for maximum output and check that L6/L7 is peaked. Repeat adjustments until no further improvement results. Check calibration at 88 MHz, 94 MHz, 100 MHz and 108 MHz, then check A.F.C. action.

A.F.C. Check: Tune receiver to 92 MHz and slightly detune F.M. signal generator either side of 92 MHz, and check that when A.F.C. button is depressed the signal is brought back on tune. This is best achieved by detuning the signal generator slightly off 92 MHz, so that the centre-zero meter moves off "0": operation of the A.F.C. button should cause the meter to return to zero. Repeat operation at 88 MHz, 94 MHz, 100 MHz and 108 MHz.

Note: The greater the input signal level, the greater the A.F.C. "pull in" range; an input signal of 3 μV to 5 μV should ensure adequate operation.

Printed Board Tag Connections

1. To lower (thin) socket of SKT1
2. To upper (thick) socket of SKT1.
3. To tag 7.
4. To switch S5A, contact 9.
5. To switch S5a, contact 6.
6. To tag 26.
7. To tag 3.
8. To tuning gang capacitor C23
9. To tuning gang central earth tag.
10. To tuning gang capacitor C34.
11. To tuning gang outer earth tag.
12. Not fitted.
13. To outer tag of M.W. aerial coil L16.
14. Not fitted.
15. Not fitted
16. Not fitted.
17. No external connection.
18. Not fitted.
19. To centre contact of volume control R44.
20. To lower tag of volume control R44.
21. To lower tag of loudspeaker.
22. Not fitted.
23. To junction of W8 and C75 positive.
24. Not fitted.
25. To C76 and junction of W8 and C75 negative.
26. To tag 6 and to switch S4B, contact 1.
27. To switch S5B, contact 7.
28. To switch S5B, contact 8.

FERGUSON — Model 3344

General Description: This model is electrically similar to the H.M.V. model 2332, which is described in later pages of this volume.

FERGUSON Model 3352

General Description: This model is electrically similar to the H.M.V. model 2342, which is described later in this section of this volume.

FERGUSON Model 3401

General Description: This model is basically similar to the Ultra model 6401, which is described in this volume.

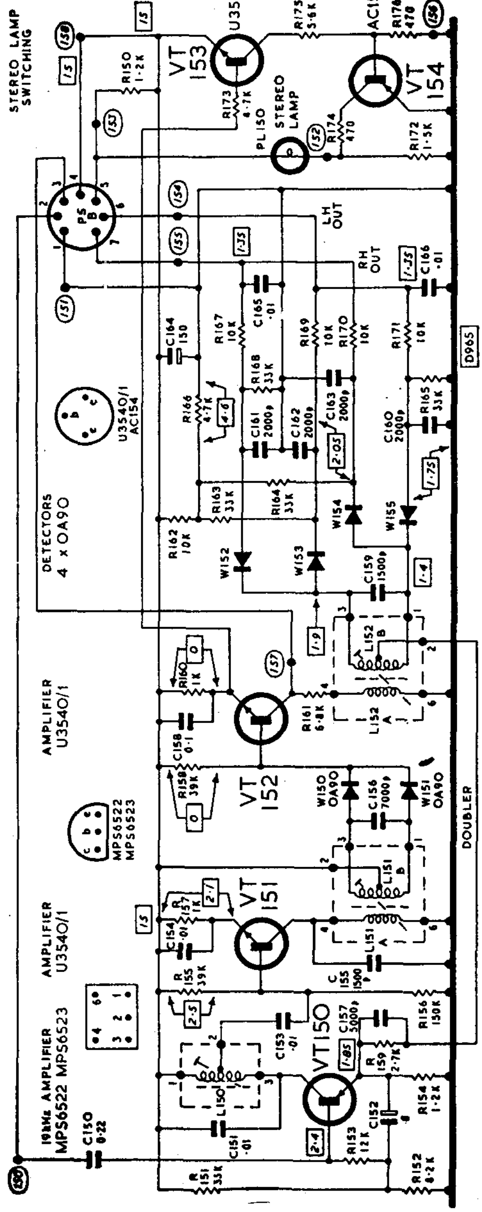
Circuit Diagram Note: The circuit shown with Ultra 6401 applies to both 6401 and 3401 models except that the microphone socket SKT1 and load resistor R26 apply to Model 6401 only. Note also that loudspeaker coupling capacitor C13 has a value of 750μF or 1000μF in Model 3401.

Component Locations Note: The layout shown for Model 6401 is basically similar except that in the Model 3401 the socket panel arrangement differs, and SKT1 and R26 are not fitted.

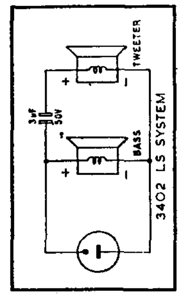
FERGUSON Unit-Audio Model 3400 and System 3402

General Description: The 3400 is a stereo-tuner record-player console, and the 3402 is a loudspeaker system.

Specification (3400): Tuning Range: 87·5 MHz–108 MHz. Internal aerial: V.H.F./F.M. dipole. Provision for external. Frequency response: within 4 dB from 30 Hz–20 kHz (with tone controls set level). Power output: 7 W per channel (sine wave) on 240 V mains supply. Total Harmonic distortion: less than 1 per cent at 5 W per channel. Controls: mains off/on, volume (loudness type), treble, bass, balance and five push-button function switch. V.H.F./F.M. radio—A.F.C. off/on and five station selector push-buttons. Turntable unit: Garrard SP25S MK II single player with interchangeable head and cueing device. Pick-up cartridge: Sonotone stereo ceramic Type 9TA with turnover diamond (L.P.) and sapphire (78) styli Type 9T1. Mains voltage range: 200–250 V A.C. 50 Hz. Power consumption: tuner amplifier, 20 W; turntable unit, 35 W. Dimensions: $36\frac{5}{8}$ in. wide $\times$ $7\frac{1}{2}$ in. high $\times$ $14\frac{3}{4}$ in. deep (stand—37 in. wide $\times$ 21 in. high $\times$ 15 in. deep).

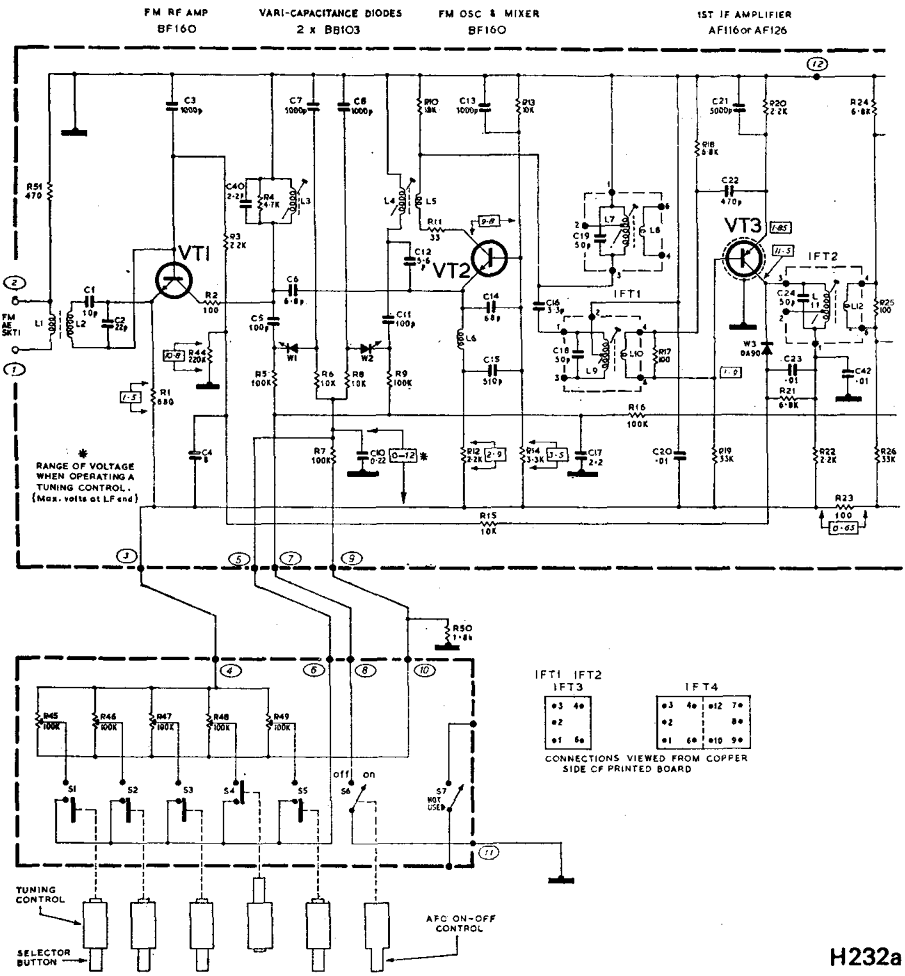


H233



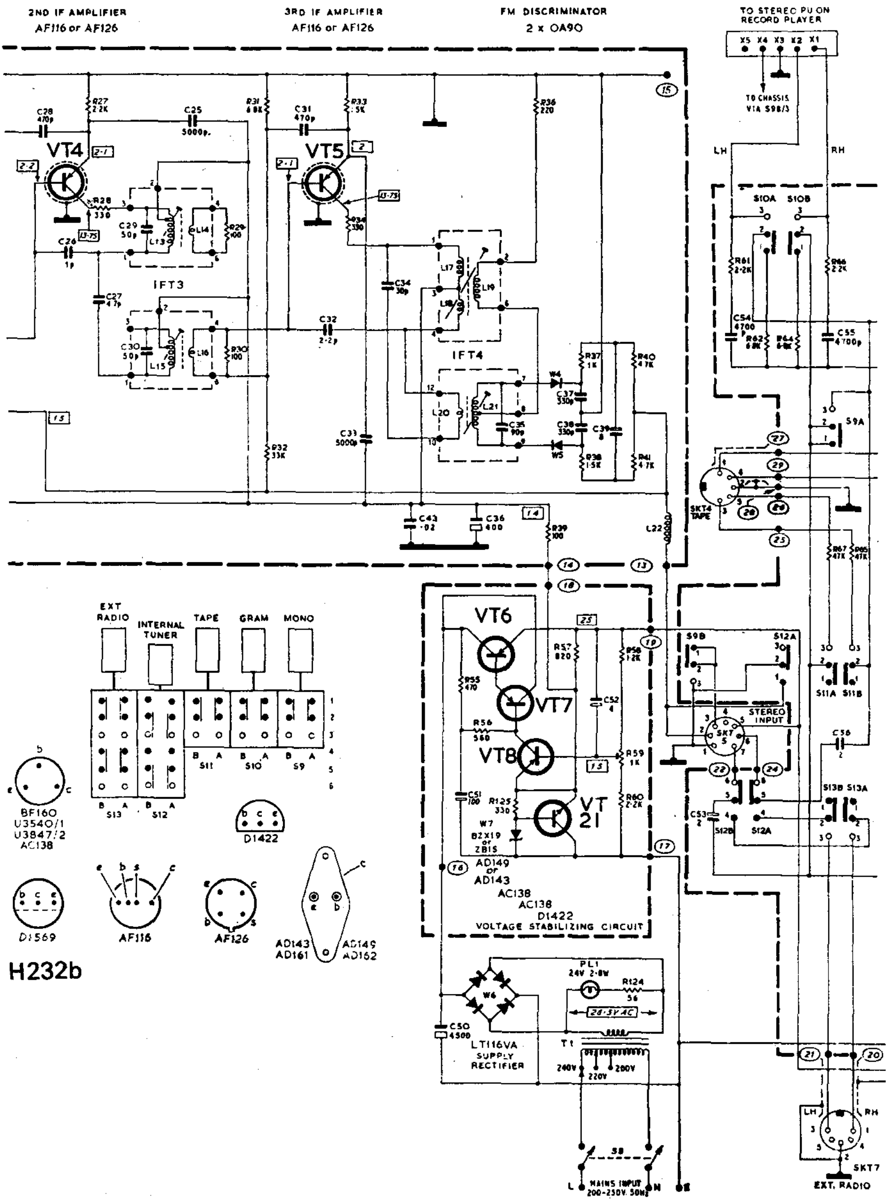
H234

Top: (H233) Circuit Diagram—Multiplex Decoder SD1; *Right:* Circuit Diagram—System 3402



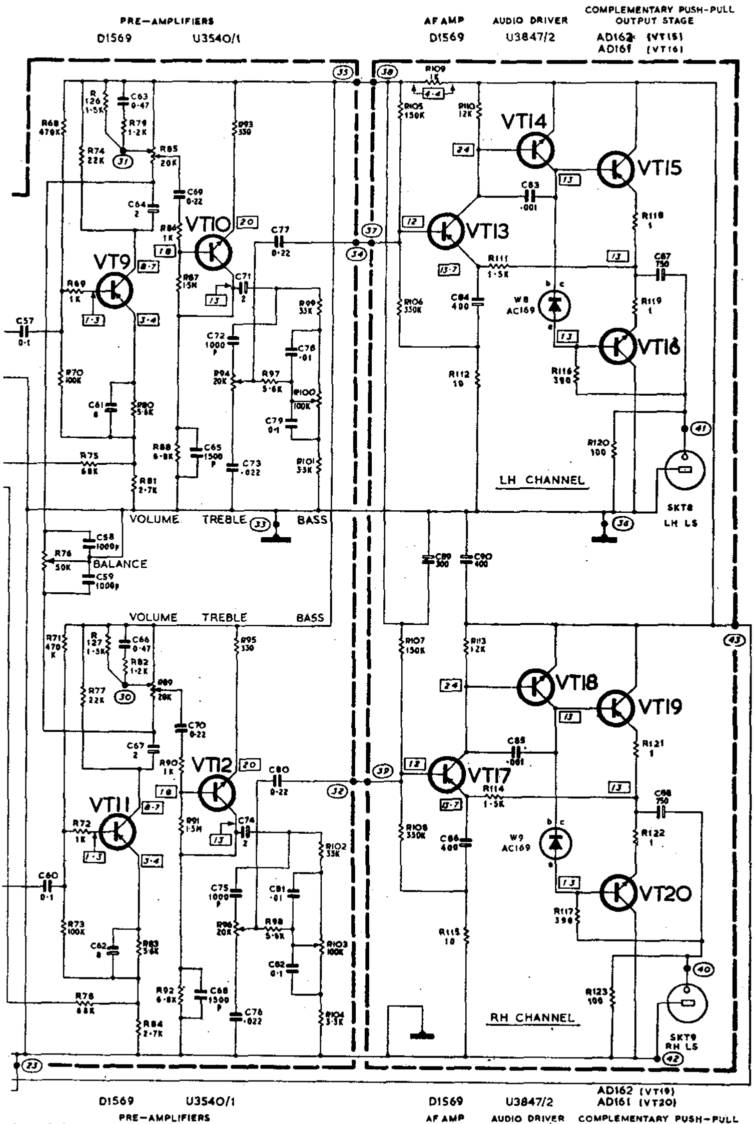
Circuit Diagram Notes: Voltage readings shown in rectangles were taken relative to positive chassis line (except where otherwise indicated) under quiescent conditions, with a 20,000 ohms/volt meter set to the 100V range and with a mains input of 245V. Ringed figures indicate printed board tag connection points.

(H232a) Circuit Diagram—Model 3400 (Part)



H232b

(H232b) Circuit Diagram—Model 3400 (Part)



H232c

(H232c) Circuit Diagram—Model 3400 (Continued)

Specification (3402): Loudspeaker system: Sealed enclosure with 8 in. high compliance bass speaker and 2 in. high frequency unit using capacitive crossover; impedance 8 Ω. Supplied with 11 ft. connecting cable terminated with 2-pin D.I.N. plug. Enclosure dimensions—10 in. wide × 26 in. high × 9 in. deep.

Note : Alternative system suitable for shelf mounting: Unit 204SS.

Service Notes:

(*a*) *Chassis Removal.* Lock turntable unit by unscrewing transit screws fully and pull off control knobs. Pull out loudspeaker plugs and F.M. aerial plug. Invert cabinet and place on grit-free resilient surface and remove base cover (8 screws). Release socket panel from cabinet (2 screws), and take out two pairs of screws and washers located at the extreme left- and right-hand edges of chassis baseboard. Invert baseboard to expose component side of boards, and rest chassis baseboard across cabinet. The individual boards can now be released as required for servicing.

To free chassis baseboard completely, unsolder pick-up leads from tag panel on control panel chassis (noting colour coding for reassembly) and also the mains feed leads to gram motor from tags on mains transformer.

(*b*) *Styli Assembly Replacement.* To remove the styli, first remove the pick-up head by unscrewing the locking collar and pulling head free of arm. Turn indicator flag to its mid position, then by pulling the indicator outwards the complete stylus assembly can be withdrawn. The indicator of the replacement assembly must be similarly placed in the mid position before attempting to press the assembly into its location. To replace pick-up head, locate the pin on the head in the slot in the pick-up arm, and slide head in. Finally, bring locking collar forward and screw up until tight.

(*c*) *Turntable Unit Removal.* Unscrew transit screws fully to lock turntable unit then take out four screws and cup washers securing motor board. Lift motor board and place it on its rear edge on floor of cabinet. Unsolder pick-up leads (noting colour coding for correct reassembly) from tag panel on motor board, and disconnect mains lead from covered terminal block on underside of baseplate. Screw transit screws fully in, and pivot clips at the lower ends of transit screws to allow them to pass through motor board then lift turntable unit clear of cabinet.

Audio Check: Before carrying out the following checks ensure that the D.C. supply is 25 V and, if necessary, correct by adjusting the pre-set potentiometer (R59) on the voltage stabiliser board.

(*a*) *Output :* Connect an 8 Ω output meter in place of each loudspeaker or, alternatively, connect an oscilloscope across the loudspeaker (i.e. tags 40 and 42 for right-hand channel, or tags 41 and 36 for left-hand channel) and observe output waveform.

Depress "mono" and "gram" push-buttons simultaneously and turn volume, bass and treble controls to maximum (fully clockwise). Inject a 15 mV, 800 Hz signal from an audio oscillator between tags X1 (or X2) and X3 of pick-up tag panel on control chassis, and adjust R76 (balance control) for

R

equal outputs from both channels and note output level; this should be 5 W clean and unclipped.

(*b*) *Tone Controls:* With test conditions as above, select "mono" operation and set tone controls mid-way. Reduce 800 Hz signal from audio oscillator to give an output level of 50 mW, i.e., input should be in the region of 1–1·5 mV. To obtain a suitable reference point on the volume control, increase signal generator level by 25 dB then reduce volume control setting to obtain original output level, i.e., 50 mW. Adjust balance control to give equal outputs from both channels.

Inject an 80 Hz signal and turn bass control from minimum to maximum; this should produce a variation in output of approximately 20 dB.

Inject an 8 kHz signal and turn treble control from minimum to maximum: this should produce a variation in output of approximately 17 dB.

Finally ensure that outputs from each channel for both bass and treble checks are within 2 dB of each other.

(*c*) *Output Sockets:* Switch to "tape", leaving "mono" button depressed and inject 200 mV, 800 Hz audio signal into pins 5 (or 3) and 2 of tape socket SKT4 with volume at maximum and tone controls set mid-way: this should produce an output of 5 W per channel.

Switch to "ext. radio", and with volume and tone controls unaltered, inject a 15–25 mV audio signal into pins 1 (or 3) and 2 of SKT7; this should produce an output of 5 W per channel. The output at the tape socket measured between pins 1 (or 4) and 2 should be 15 mV and operation of volume, bass or treble controls should have no effect on this output voltage.

Switch to "int. tuner" and apply a 1 mV R.F. signal to F.M. aerial socket SKT1; this should give an output of 70 mV measured at pins 1 (or 4) and 2 of tape socket SKT4.

Alignment (General): For access to component sides of boards see Service Notes (*a*), Chassis Removal. Connect an output meter adjusted for 8 Ω impedance in place of left-hand or right-hand loudspeakers, or a 20,000 ohm/volt meter set to a suitable A.C. voltage range between tag 41 or 40 and chassis line. To ensure satisfactory operation of A.F.C. it is essential to ensure that the discriminator is adjusted to a balanced condition. This is achieved by measuring voltage between junction of R40–R41 and chassis line. As this voltage will swing alternately positive and negative, a centre-zero meter (25-0-25 μA) with a series 22 KΩ resistor produces a satisfactory movement. The meter should read 0 V on completion of alignment. An Avo Model 8 on the 50 μA D.C. range with series 22 KΩ resistor will also suffice but it is not so convenient for following the voltage swing and zero reading.

Alignment (I.F.): Inject a 10·7 MHz signal (25 kHz deviation) via 30 pF capacitor to junction of R12–C15, with generator earth lead connected to "earthy" end of R10. 1. Switch off A.F.C. 2. Detune L3 by unscrewing core 2–3 turns. 3. Peak L21 and L17/18 for maximum audio output. (If centre-zero meter does not read zero, a slight adjustment of L21 should be made to produce this condition.) 4. If L21 was readjusted, re-peak L17/18 and then

adjust L15, L13, L11, L9 and L7 for maximum audio output. (If centre-zero meter has moved off zero, correct with L21 and repeat I.F. alignment.)

Complete I.F. alignment by checking sensitivity. With input of approximately 100μV reduce volume control setting to retain output at approximately 500mW: maximum audio output should now occur with zero on centre-zero meter and coincide with minimum A.M. noise or modulation. A check of balanced alignment may be made by swinging generator frequency either side of 10·7MHz when centre-zero meter should show a similar deflection to positive and negative.

Alignment (R.F.): Retain centre-zero meter connection as for I.F. alignment. Apply 87·5MHz signal (25kHz deviation) to aerial terminals. Select a tuning push-button and turn to L.F. end of band (i.e., bottom of scale). Tune oscillator coil L4 for maximum output: zero reading on the centre-zero meter will indicate correct tuning point. Change input frequency to 94MHz or any suitable frequency avoiding an interfering station. Tune push-button tuning control to this frequency for maximum output and peak R.F. coil L3 for maximum output. During this peaking operation a slight "pulling" of the oscillator may occur shown by the centre-zero meter moving off zero; this should be corrected by the push-button tuning control and L3 then re-peaked for maximum output.

During final alignment, input level should be approximately 10μV and the volume control adjusted for a convenient output level.

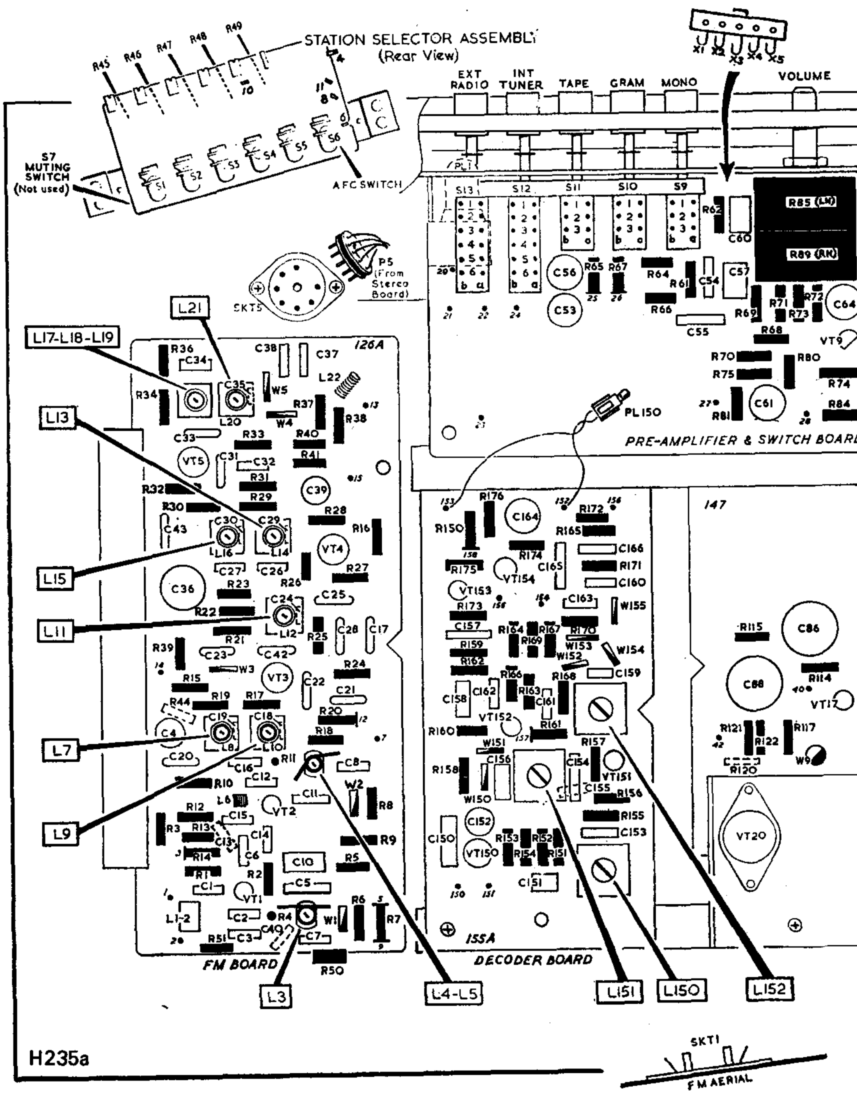
Alignment (Multiplex Decoder SD1): Although alignment of the decoder panel is quite straightforward, no attempt should be made at realignment unless suitable equipment is available. This should consist of an encoder providing a 19kHz pilot signal and also a composite signal that may be switched to provide a difference signal, a mono signal, and an easily identified combined left- and right-hand signal (or possibly separate left-hand and right-hand signals).

Inject a 19kHz pilot signal to pin 2 of SKT5 (decoder socket) and connect a millivoltmeter, capable of reading up to 250mV at 19kHz, between pin 4 of L152 and chassis.

Peak L150, L151 and L152 for maximum output (reducing 19kHz signal level during alignment to maintain an output of 200mV). L152 should be peaked with the core almost fully unscrewed but if no peak is observed the core should be left fully unscrewed. For an output of 200mV the 19kHz input should be approximately 7 to 10mV.

Inject a composite signal to pin 2 of SKT5, and select the difference signal. With an input of 60–75mV, check that the output from each channel is equal; if otherwise, slightly readjust L151 for maximum equal outputs. With the voltmeter connected to pin 6, then to pin 7 of SKT5 the output from each should be 60mV. If the output is checked at the loudspeaker sockets it is essential that the audio amplifiers are correctly balanced by balance control R76 before commencing alignment.

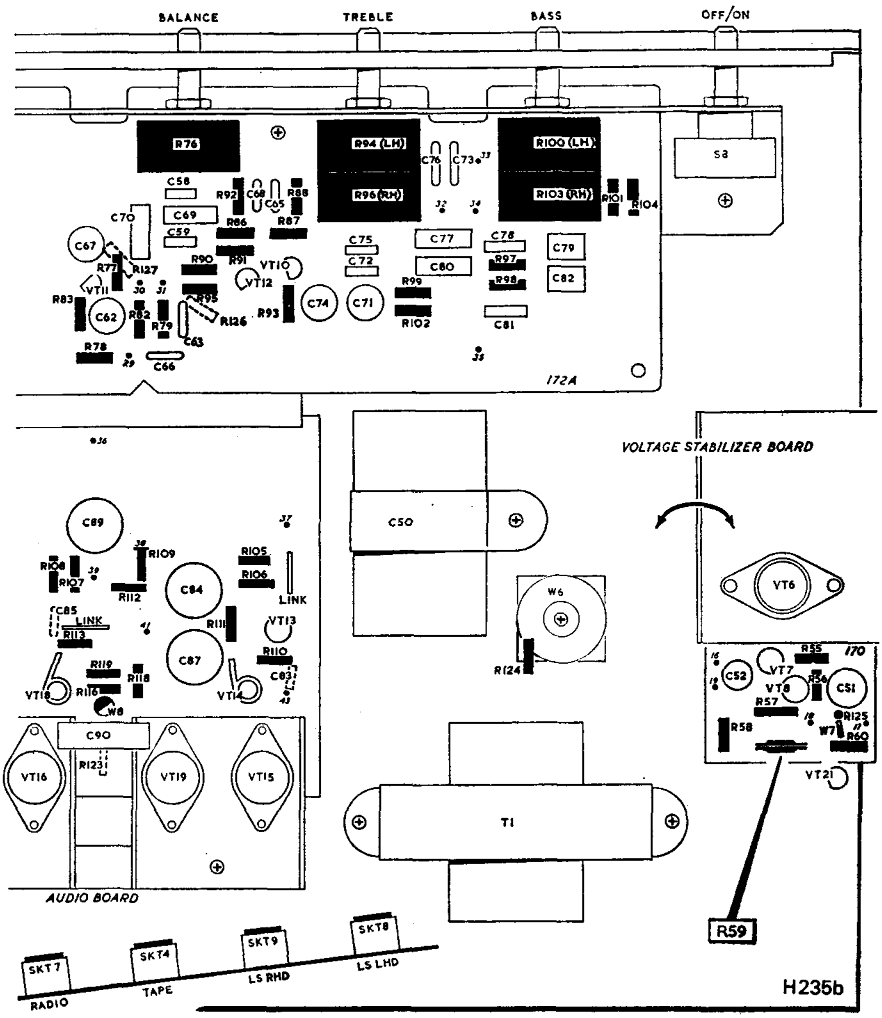
If left-hand and right-hand signals are available, check that decoder outputs are correctly phased, i.e., right-hand input gives an output from right-hand



(H235a) Component Locations and Alignment Adjustments—Model 3400 (Part)

channel, and that separation is satisfactory, i.e., right-hand input gives minimum left-hand output.

The stereo indicator lamp should light with a composite signal input of 100–125 mB.



(H235b) Component Locations and Alignment Adjustments—Model 3400 (Continued)

For overall alignment of the multiplex decoder a difference signal (R.F. carrier) should be injected to the aerial sockets. The signal strength should be sufficient to cause limiting (25μV approximately) and a check should be made to ensure that the audio output from each channel is balanced. Ensure that the

balance control has been set correctly during audio checks otherwise results may be misleading and, if necessary slightly readjust L151 to obtain correct balance. Finally, if L151 has been readjusted check that phasing is correct.

Circuit Description: The R.F. and oscillator sections follow conventional transistor tuner circuitry except that in both the R.F. and oscillator tuned circuits a variable capacitance diode provides the variable capacity tuning element. The voltage across these diodes, and thereby the capacitance, is varied by means of one of the tuner potentiometers R45–49 which together with R50 and R7 form a potentiometer network across the D.C. supply lines. This variable voltage is applied to each diode tuned circuit via R6 and R8. This facility of tuning by voltage variation is further utilised for the application of A.F.C. (Automatic Frequency Control). Any out of balance voltage due to mistuning is fed via R16 and then to each circuit via R5 and R9 of such polarity as to correct tuning. This correction voltage is shortened out by S6 in the A.F.C. "OFF" position.

A.G.C. is applied to the R.F. amplifier via R15 and is derived from W3 in VT3 collector circuit. R44 is required to provide a base voltage suitable for the operation of transistors of varying parameters.

Stereo output from the pick-up is fed via "gram" switch, S10A and B, and pre-amplified by silicon planar transistors VT9/VT10 (left-hand channel) and VT11/VT12 (right-hand channel).

The left- and right-hand outputs are fed to VT13 and VT17, the respective audio amplifiers. The stereo–mono switch S9A effectively parallels the left- and right-hand pick-up channels for mono reproduction.

Separate bass and treble controls and a loudness type volume control are incorporated in the coupling of the pre-amplifiers and audio amplifiers of each channel. A resistive/capacitive network is fitted to the tapped volume control of each channel so that additional bass boost is applied as the volume level is lowered.

The audio output of VT13 and VT17 is applied to the respective left- and right-hand channel audio driver stages which employ N.P.N. type transistors (VT14 and VT18). Stabilising diodes W8 (left-hand channel) and W9 right-hand channel) are series connected in the collector circuit and are D.C. fed into the complementary push–pull output stages, VT15–VT16 (left-hand channel) and VT19–VT20 (right-hand channel).

The output transistors are mounted in large heat sinks and to avoid insulation problems, the P.N.P. transistors are located together in one heat sink and N.P.N. types are together in the other. The diodes are fitted close to the heat sink so that any temperature changes are immediately transferred to the diodes to ensure effective compensation.

Overall negative feedback is applied to the bases of audio amplifiers VT13 (LH) and VT17 (RH) from the push–pull power output stages VT15–VT16 (LH) and VT19–VT20 (RH) via R111, C84 and R114, C86 respectively.

A fully isolated mains transformer and full-wave rectifier provides the line voltage supply whilst VT6–8, VT21 and a Zener diode W7 provide suitable stabilised supply voltages to the F.M. radio, stereo decoder and audio circuits.

Circuit Description (Multiplex Decoder SD1): The output from the discriminator is fed to VT150 via C150. The 19kHz tuned circuit in the collector of VT150 filters out the 19kHz pilot frequency which is fed via C153 to the base of VT151. Further amplification takes place and frequency doubling (to 38kHz) is achieved by W150 and W151 in the secondary winding of 19kHz filter coil L151b, in the collector of this stage. The resultant 38kHz signal is further amplified by VT152.

VT150 emitter also provides a low impedance source for the multiplex signal which is taken via the compensation network R159, C157 to the centre tap of the 38kHz tuned transformer winding (L152b).

The multiplex signal is now added to the reconstituted 38kHz sub-carrier developed in the secondary of L152 and the composite signal is fed to the two pairs of diodes W152, W153 and W154, W155. The sub-carrier will be reversed in phase due to the centre tap of L152 secondary and this has the effect of interchanging the left- and right-hand channels on the composite signal waveform, therefore, the outputs of W152 and W154 combine to give the right-hand output and the outputs of W153 and W155 give the left-hand output. Pulses of the sub-carrier appearing across the diode loads will be of opposite polarity and will cancel out.

In order to provide compatibility, the diodes are forward biased so that they remain conductive in the absence of the pilot tone.

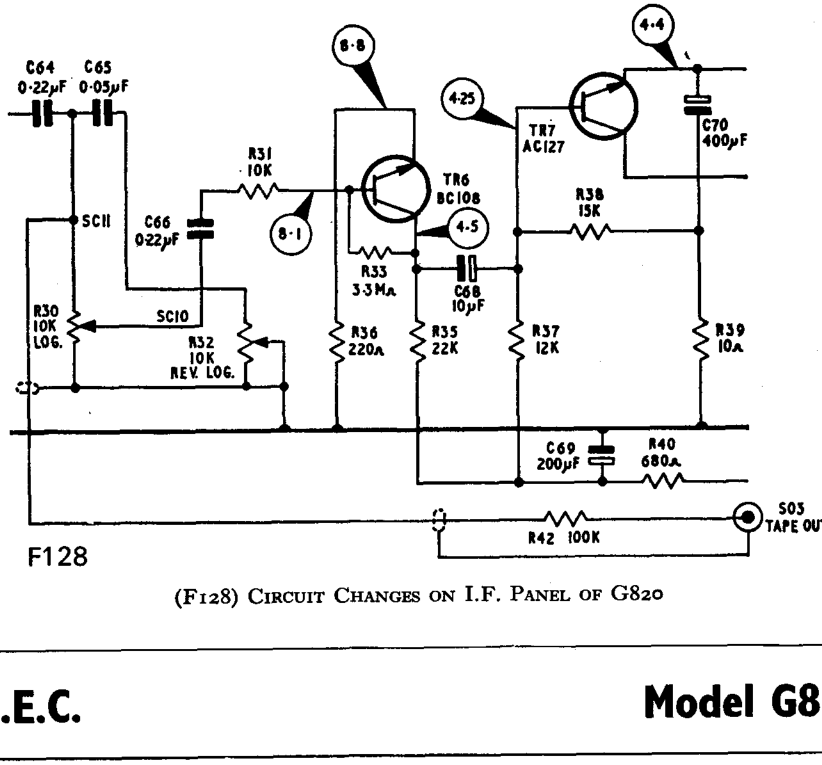
The right-hand and left-hand outputs are fed via their respective de-emphasis components R167, C165 (RH) and R171, C166 (LH) to the audio amplifier stages.

Part of the 38kHz sub-carrier appearing at the emitter of VT152 is fed via R173 to the base of VT153; this is coupled to the base of VT154 which will conduct causing the bulb in its collector circuit to light. In the absence of the 38kHz sub-carrier (mono transmission) VT154 will be cut off and the light will be extinguished.

G.E.C. Model G836

General Description: This model employs a chassis which is similar to that of the G.E.C. model G820, which is described in the 1967–68 volume, on page 186. Changes in circuitry are given below, and this information should be used in conjunction with the G820 data.

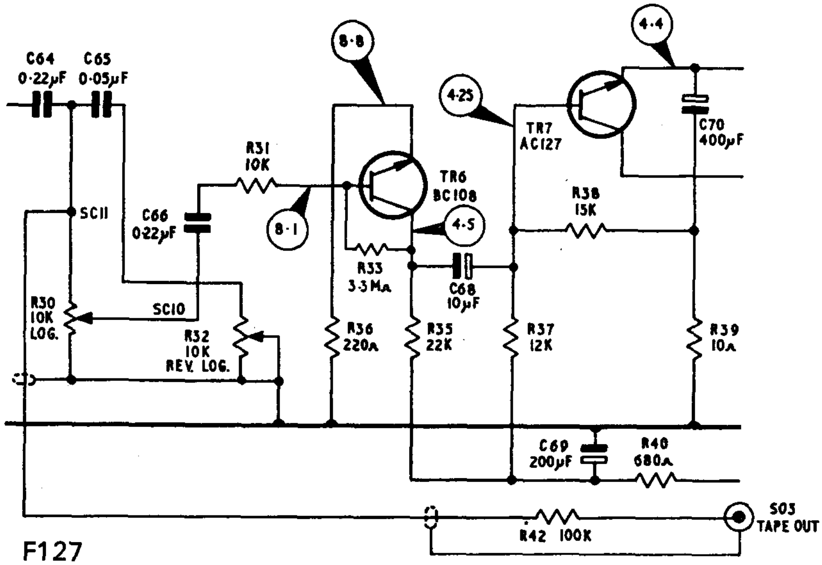
Circuit Differences: C67, 64μF capacitor is deleted; R34, 120kΩ resistor is deleted; TR6, OC71 transistor changed to type BC108; C66, 10μF capacitor changed to 0·22μF; R31, 470Ω resistor changed to 10kΩ; R33, 47kΩ resistor changed to 3·3MΩ; R35, 8·2kΩ resistor changed to 22kΩ. *Note*: The physical positions of R33 and R35 are changed. R36, 6·8kΩ resistor changed to 220Ω; C3, 1000pF capacitor changed to 120pF.



(F128) Circuit Changes on I.F. Panel of G820

G.E.C. Model G837

General Description: This model employs a chassis similar to that of the G.E.C. model G817, which is described in the 1966–67 volume, on page 150. Changes in circuitry are given opposite, and these should be used in conjunction with the G817 data.



(F127) Changes in Circuitry on the I.F. Panel of the G817

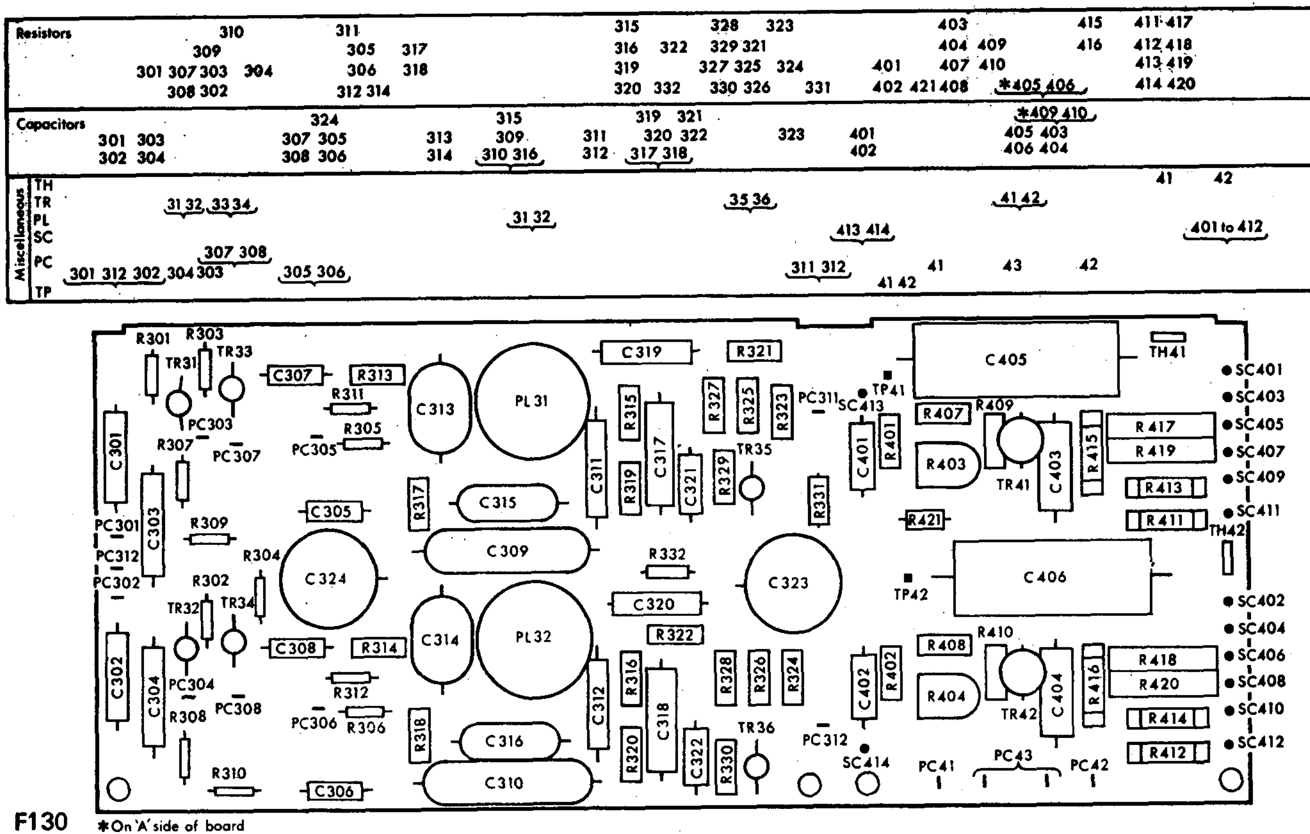
Circuit Differences: C67, 64μF capacitor is deleted; R34, 120kΩ resistor is deleted; TR6, OC71 transistor changed to type BC108; C66, 10μF capacitor changed to 0·22μF; R31, 470Ω resistor changed to 10kΩ; R33, 47kΩ resistor changed to 3·3MΩ; R35, 8·2kΩ resistor changed to 22kΩ. *Note*: The physical positions of R33 and R35 are changed. R36, 6.8kΩ resistor changed to 220Ω; C3, 1000pF capacitor changed to 120pF.

G.E.C. — Model G987

General Description: Fully transistorised stereo record player, incorporating a four-speed automatic record changer unit.

Record Changer Unit: BSR UA65, fitted with a C1 ceramic cartridge, having a diamond stylus in L.P. positions.

Loudspeakers: Two "long throw" speakers and two tweeters are housed in airtight enclosures. These enclosures are removable from main cabinet for spacing further apart, and leads/sockets are provided for this purpose on both units and main cabinet. Note that additional speakers must not be connected to the model G987.



(F130) Component-Locations—Model G987

Mains Input: 230–250 V A.C. only.

Tape Output Socket: Provision is made for monitored recording of mono or stereo gramophone records, independent of the loudness control setting. Here, attention is drawn to the Copyright Act. Mono or stereo tape recordings may also be played back via the amplifier. Connections for these facilities are made by means of a 5-pin D.I.N. plug.

Auxiliary Socket: A miniature jack socket will enable an input signal (portable radio, sound track, etc.) to be fed to either the right-hand channel or both channels when the mono button is depressed. The input is via the loudness control.

F.M. Aerial: An external F.M. aerial socket is provided for use with the F.M. tuner, when it is fitted.

F.M. Tuner Unit: Located beneath the bottom (removable) panel of the left-hand compartment is a mains socket which is secondary to the on/off amplifier switch, F.M. aerial plug and audio output connections wired within the cabinet assembly, ready for use.

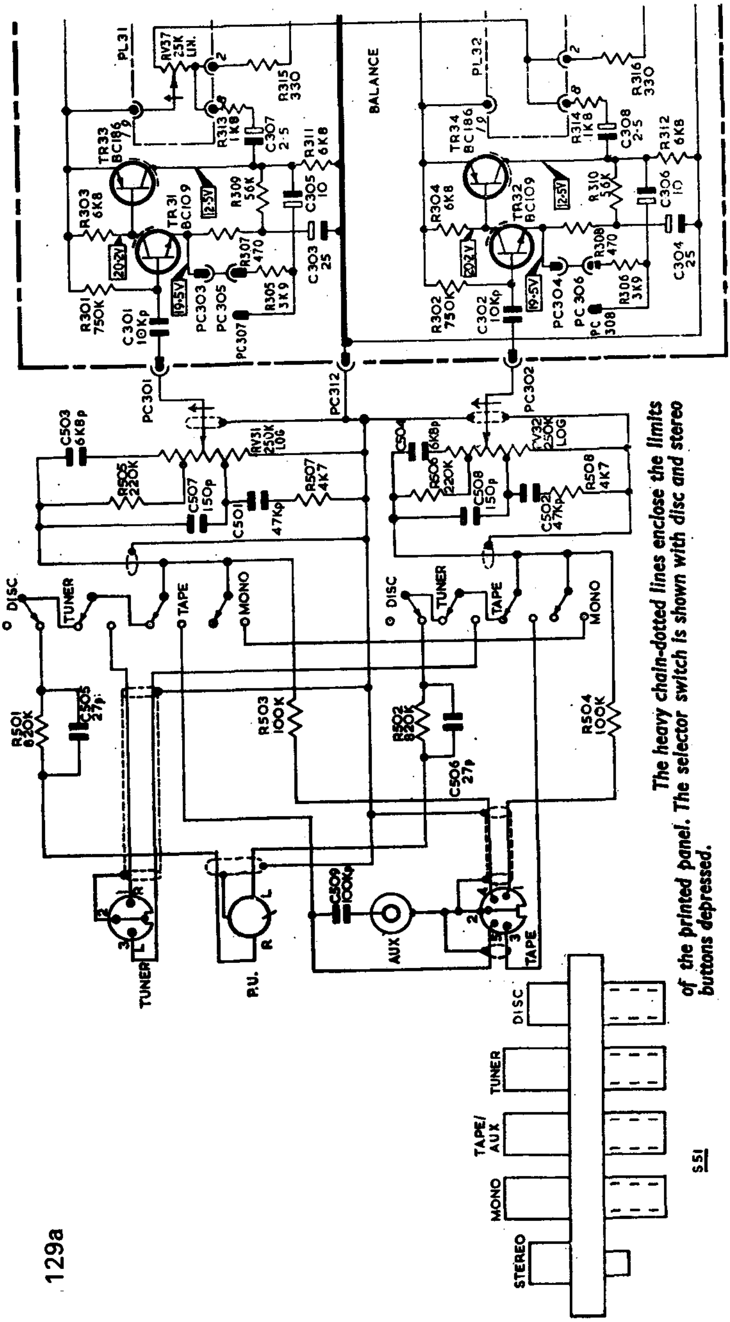
Circuit Description: The various inputs, after selection by the switch S51, are fed to the loudness control RV31/32. As the slider is moved down, bass and treble boost is progressively applied by C501/502 and R507/508. The signal is fed to the base of TR31/32 (BC109) which is directly coupled to TR33/34 (BC186), these transistors being stabilised by D.C. feedback. The input transistor operates at a low collector current, about 130μA, for low noise. This, in conjunction with negative A.C. feedback applied through C305/306 and R305/306, gives the stage a high input impedance of about 300 K.

The output from the collector of TR33/34 is A.C. coupled to the balance control RV37 and then fed via C317/318 to the base of TR35/36 (BC108) and used in a feedback tone control arrangement. Part of the BC108 output, taken from the junction of R321/322 and R323/324, is coupled by C319/320 to the sliders of the bass and treble controls RV33/34 and RV35/36. The output of this conventional tone control network is returned to the base of TR35/36.

The BC108 collector is connected to the base of the driver TR41/42 (BFY52) via C401/402 and R401/402. The bases of the output pair TR43/44 (AD161) and TR45/46 (AD162) are driven directly from the BFY52 collector. The collector load of the BFY52 is connected to the emitters of the AD161 and AD162 through C403/404, R417/418 and R419/420 so that the output pair operates in the common emitter configuration giving maximum gain. This arrangement, which also provides some hum-bucking, is stabilised by D.C. feedback to the base of the driver via R409/410. A pre-set potentiometer R403/404 accommodates component tolerances and transistor spreads.

H.F. feedback is applied by C409/410. To minimise crossover distortion the quiescent current in the output pair is arranged to be approximately 8 mA by R415/416 across TH41/42, a VA1077 thermistor which keeps the current practically constant with different ambient temperatures.

The main loudspeakers LS41/42 and tweeters LS43/44 are capacitively

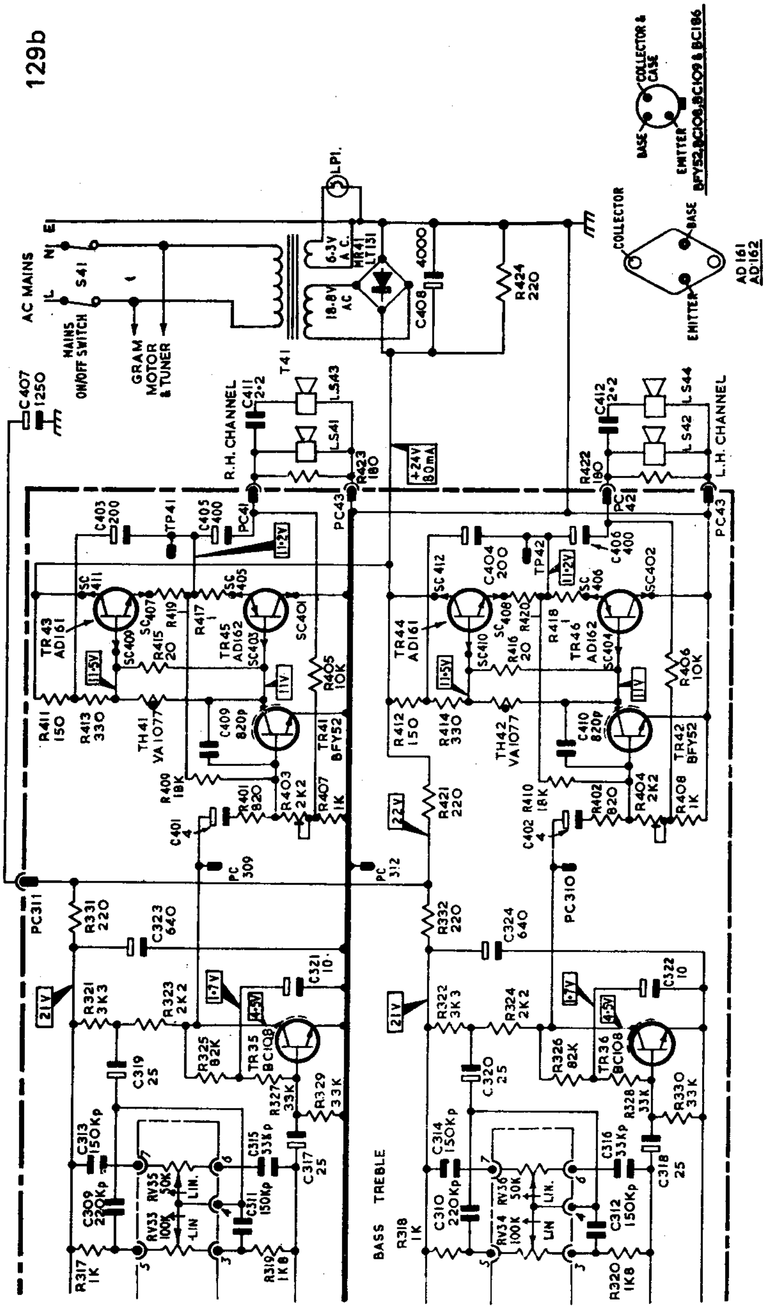


129a

The heavy chain-dotted lines enclose the limits of the printed panel. The selector switch is shown with disc and stereo buttons depressed.

(F129a) Circuit Diagram—Model G987 (Part)

129b



(F129b) Circuit Diagram—Model G987 (Continued)

coupled to the emitters of the output pair by C405/406 and C411/412 respectively.

Power Supply: A common negative chassis connection is used and 24 V positive supply is derived from a bridge rectifier MR41, smoothed by C408, with additional decoupling for the pre-amplifiers provided by R421, C407, R331/332 and C323/324.

D.C. Measurements. Taken with AVO 8. No signal input. Voltages measured with respect to chassis. Loudness control at minimum.

Ref.	*Transistor*	*Emitter*	*Base*	*Collector*
TR31 and 32	BC 109	19·5 V	—	20·2 V
TR33 and 34	BC 186	21 V	20·2 V	12·5 V
TR35 and 36	BC 108	0	0·65 V	4·5 V
TR41 and 42	BFY52	0	0·6 V	11 V
TR43 and 44	AD161	*	11·5 V	24 V
TR45 and 46	AD162	*	11 V	0
Across C321 and C322			1·7 V	
Across C407			22 V	
Across C408			24 V	
*TP41 and TP42 to chassis			11·2 V	
Total quiescent current	80 mA			
Input to rectifier	18·8 V A.C.			

Dismantling: To remove amplifier unit, take out two wood screws on side of amplifier case and lift upwards to extent of connecting leads. Unplug loudspeaker leads from Amp tags PC41–44, and record changer mains lead. Unplug pick-up leads, tuner input lead, and leads to tape socket. Then, to remove record changer, take out four wood screws securing motor board and raise assembly enough to release record changer transit clips.

Pre-Set Adjustment (R403, R404): Connect an 8 Ω impedance (output meter) to each channel. Connect an oscilloscope across one output meter (8 Ω impedance). Feed in a 1 kHz signal to this channel, and increase amplitude until clipping of the output waveform occurs. Adjust R403 or R404 for symmetrical clipping on positive and negative peaks. Adjust other channel similarly. Then repeat both adjustments. If an oscilloscope is not available, set loudness control to minimum and connect an 8 Ω load to each channel. Connect a high impedance voltmeter between TP41/42 and chassis. Adjust R403/R404 to obtain a reading of 11·2 V.

Audio Measurements: Using an 8 Ω load, with loudness control at maximum and bass, treble and balance controls in mid position. 25 mV (at 1 kHz) input to tape socket produces 5 W output.

HACKER DEMOCRAT Model RP34

General Description: Compact portable receiver with 9 transistors and 1 diode. Aerial, 8 in. ferrite rod. Speaker: elliptical, 15 Ω. Batteries, 2 × PP9 Ever Ready. Battery current, 18 mA approximately (quiescent). Output, 15 W.

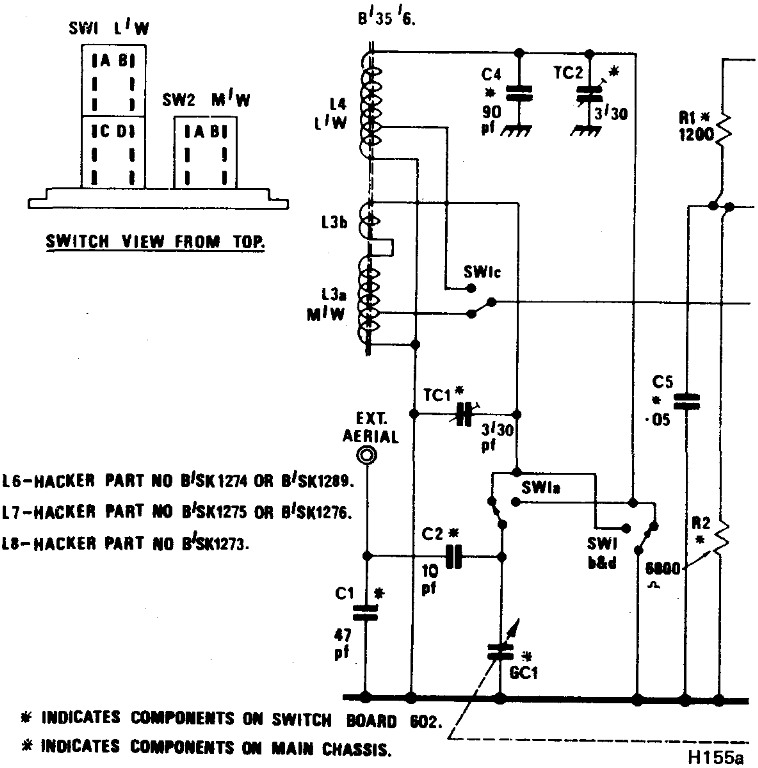
Wavebands: M.W.: 191–535 metres. L.W.: 1120–1980 metres.

Circuit Description (Tuner): The car aerial which is coupled via C1 is switched by SW1A on to the top of L36 for M.W. and L4 for L.W. L3 and L4 are the aerial coils and are resonated at each end of a long length of ferrite rod, producing a highly selective and sensitive internal aerial.

GC1 is the variable tuning element for L3 and L4 and TC1 and TC2 are the M.W. and L.W. aerial trimming condensers respectively. The signals are fed to the base of T2 via the low impedance taps on L3 or L4 via C7.

T2 is a mixer and operates by local oscillations produced by T1 fed to the emitter via the low impedance winding in L5 (osc. coil).

The oscillator is tuned on M.W. by C9, GC2 and TC3, C9 being the padding condenser, TC3 the trimming condenser and GC2 the variable tuning element.



(H155a) Circuit Diagram of Tuner—Model RP34 (Part)

These same conditions with the exception of TC3, tune oscillator on L.W. with addition of C10 and TC4, TC4 being the trimming condenser (L.W. only).

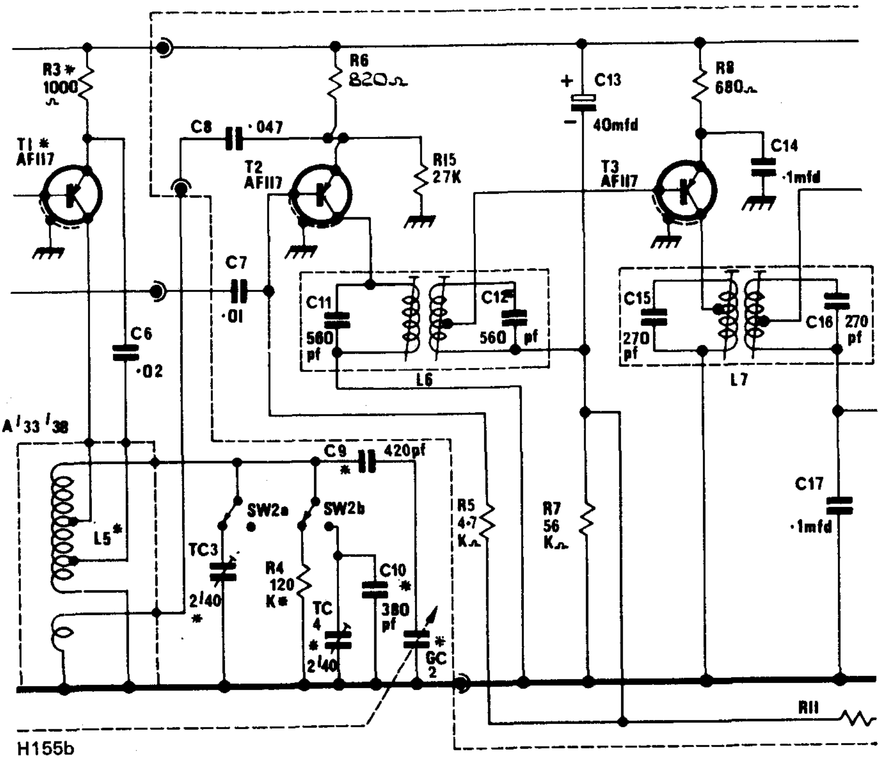
From T2 the signals are fed via L6 to the base of T3 which is a grounded emitter I.F. amplifier. The base bias varies according to the A.G.C. conditions but is held constant in the low signal (no A.G.C.) conditions by the network R7, R11, R13 and VR1. A.G.C. is also applied via R5 to the base of T2

From T3 the signals are fed via L7 to the base of T4 which is also a grounded emitter I.F. amplifier. The base bias is derived from the network R9 and R10. Collector current is stabilised by R12.

From T4 the signals are fed to the detector diode CR1 from which the audio signal and the A.G.C. voltage is taken via R13 and R11 respectively.

VR1 is the volume control and the resulting A.F. developed across it is fed to the amplifier via the interconnecting plug PL1.

Circuit Description (Amplifier): The circuit employs 5 transistors D.C. coupled with a high A.C./D.C. feedback loop. The amplifier is operated in Class B single ended push-pull output. Phase inversion is achieved by virtue of the complimentary pair. Overall feedback both A.C. and D.C. is applied to T1



(H155b) Circuit Diagram of Tuner—Model RP34 (Part)

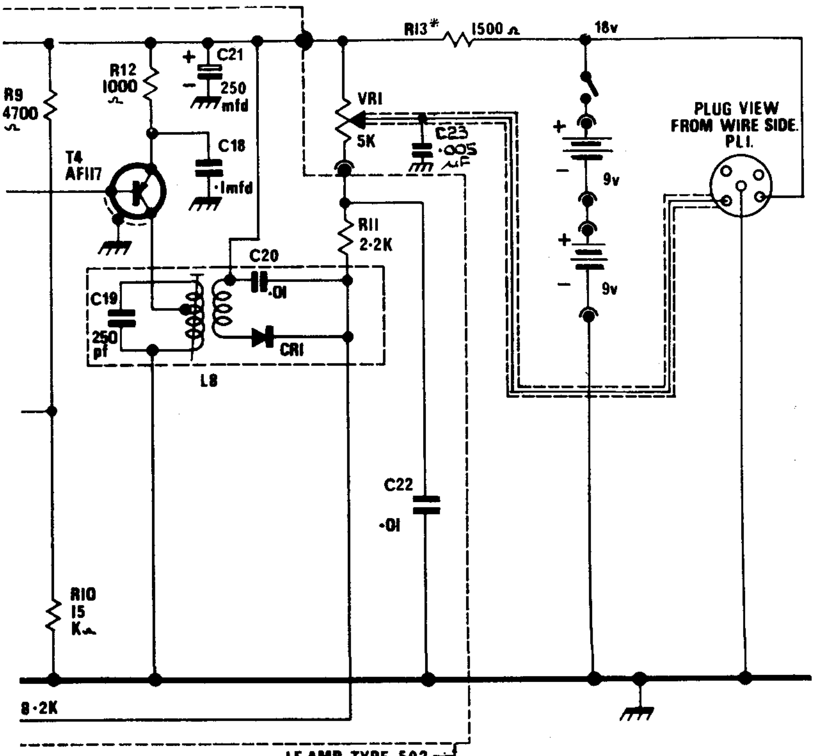
via potential divider network C5, R5, R6, C6 and R4, C4. A small amount of L.F. frequency compensation is achieved by the feedback network C5, R5 across R6.

Dismantling: Back of receiver is easily removed by laying face down on a soft surface and pushing top edge of back with the thumbs thereby releasing the spring catches. The back may then be lifted clear. Remove batteries. The amplifier is removed by first unplugging the five-pin power plug and the L.S. plugs, then loosening the 4BA nuts securing amplifier to battery box cover.

To remove tuner, gently prise off caps covering the handle pivots and remove the two 4BA countersunk screws concealed beneath. The tuner may then be gently eased forward until the black and green car aerial leads can be unplugged from the appropriate slot.

Removal of loudspeaker is self explanatory but in replacing, note that the nuts should be tightened alternately and care taken to avoid overtightening.

Static Voltages (R.F./I.F. Panel): Receiver switched to M.W. Measured with Avo 8, with respect to H.T.+ (18V) rail at positive terminal of C21 (250μF).



H155c

(H155c) Circuit Diagram of Tuner—Model RP34 (Continued)

		E	B	C
T1	AF117	−1·1 V	−1·25 V	−8·0 V
T2	AF117	−0·9 V	−1·9 V	−8·0 V
T3	AF117	−0·9 V	−1·05 V	−8·0 V
T4	AF117	−1·5 V	−1·7 V	−8·0 V

Oscillator Drive: Receiver switched to M.W. Measured with valve voltmeter between T1 emitter and chassis. M.W. 80–100 mV. Receiver switched to L.W. 60–80 mV.

Alignment and Sensitivity Checks: *Test gear required:* (1) A.M. signal generator covering 470 kHz, 600 kHz, 100 kHz, 1500 kHz, 174 kHz, 260 kHz. (2) Valve voltmeter. (3) Wobbulator covering 470 kHz. (4) Oscilloscope. (5) Shielded radiating loop.

The latter item consists of a length of copper or brass tube of a diameter suitable to clear 3 strands of 20 swg P.V.C. wire or similar. The tube is bent into a circle of approximately 10 in. diameter and the two ends pass through a copper or brass box approximately 2·5 in. square, the latter having one open side. The tube is insulated at one end from the box by a suitable rubber grommet and the other end soldered to the box.

The lead from the signal generator should be screened and the braid soldered to the same point to which the tube is soldered. Three turns of 20 swg P.V.C. wire or similar is then fed through the tube and one end also soldered to the box. The other end must go via a 405 Ω 1 per cent resistor to the inner of the screened lead from the generator. The loop should be placed at 90° to the ferrite rod aerial in the receiver with approximately 24 in. between centres for all R.F. alignments.

I.F. Alignment: Connect oscilloscope across volume control and inject wobbulator and marker signals (470 kHz) across L3 (M.W. aerial coil). Switch receiver to M.W. and close gang. Adjust the instruments to give a reasonable display on the oscilloscope, making sure that the input is kept as low as possible in order to avoid overloading and the effect of A.G.C. action. Adjust the cores of L6, L7 and L8 to obtain an even response curve with ± 3 kHz approx. 4 dB down at either side of the centre frequency of 470 kHz.

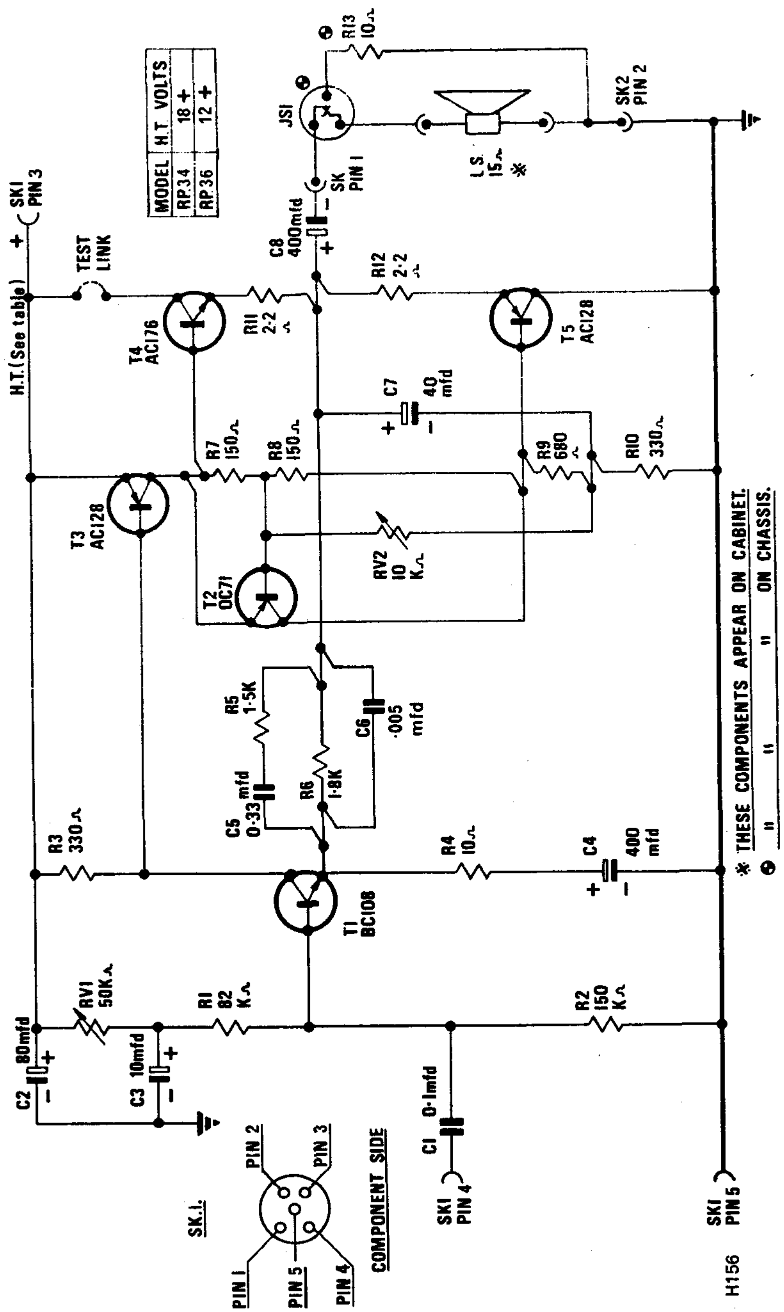
R.F. Alignment:

1. Check pointer datum. The centre of the pointer must coincide with the edge of the right-hand end of the frequency scale when the tuning gang is just brought up to the fully enmeshed position from open. It is important that the adjustment is checked before alignment of the R.F. circuit is commenced.

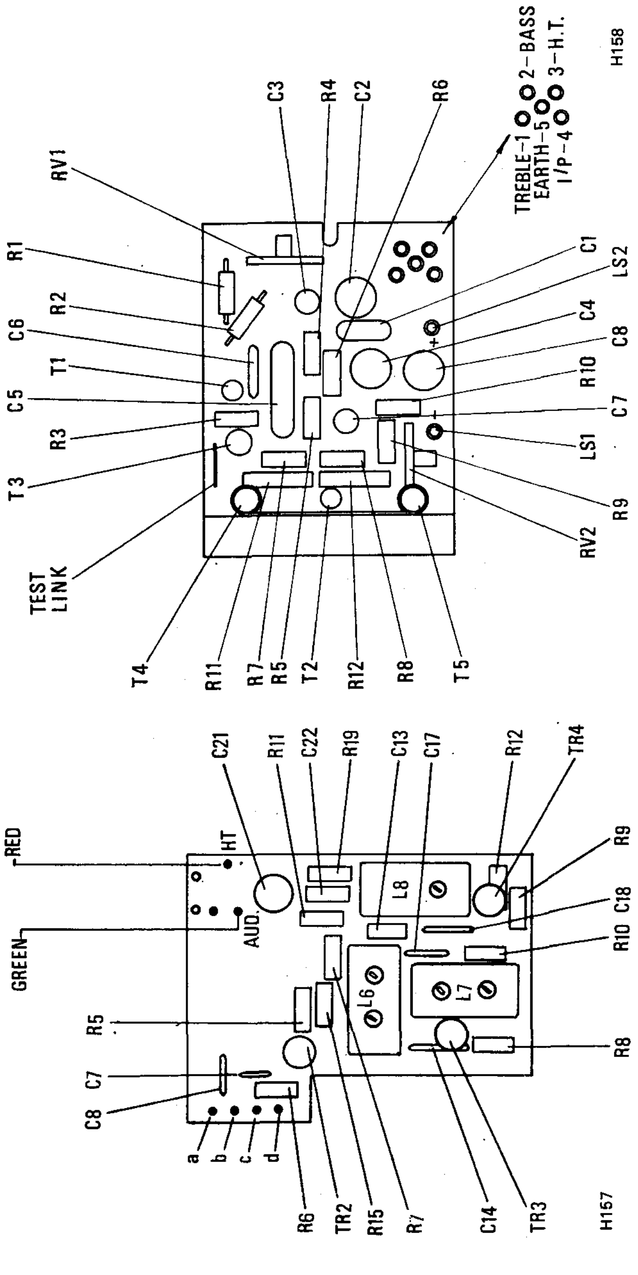
2. Fix L3a in the centre of the ferrite rod so that the start of the coil is 4 in. from the end of the rod.

3. Switch the receiver to M.W. and set pointer to 600 kHz (500 metres). Inject a signal from A.M. generator via loop at 600 kHz and adjust core of oscillator (L5) to give the maximum signal as indicated by oscilloscope or output meter connected to output. (Be careful to avoid overloading by using excessive input signal.)

4. Inject via the loop, a signal of 1500 kHz and tune the receiver to the 1500 kHz (200 metre) mark on the scale. Adjust TC3 for maximum. Repeat 3 and 4 until calibration is accurate.



(H156) Circuit Diagram of Amplifier—Model RP34



Left: (H157) Component Locations—I.F. Amplifier. *Right:* (H158) Component Locations—L.F. Amplifier—Model RP34

5. Inject via the loop a 600kHz signal and with the receiver tuned to the 600kHz (500 metre) mark on the scale, adjust the position of the M.W. coil L3b on the ferrite rod to give maximum output.

6. Retune receiver and generator to 1500kHz (200 metres) and adjust TC1 for maximum output. Repeat 5 and 6 until no further improvement can be obtained.

7. Switch the receiver to L.W. Tune to B.B.C. 2 on 200kHz (1500 metres) and adjust TC4 for maximum output.

8. Inject, via the loop, a signal of 174kHz (1718 metres) and tune the receiver to this frequency. Adjust the position of the L.W. coil (L4) on the ferrite rod for maximum output.

9. Inject, via the loop, a signal of 260kHz (1154 metres) and tune the receiver to this frequency. Adjust TC2 for maximum output. Repeat 8 and 9 until no further improvement can be obtained.

10. Fix the coils carefully in position on the ferrite rod with adhesive tape.

I.F. Sensitivity: Measured with receiver switched to M.W. and gang closed. With signal generator (10 Ω source) adjusted to 460kHz (30 per cent modulation at 400Hz) connected across L1 (M.W. aerial coil) and valve voltmeter connected across VR1, adjust generator output to give 25mV on valve voltmeter. The generator output to give the reading should not exceed 30μV.

R.F. Sensitivity: For the same valve voltmeter reading (25mV) a signal at R.F. (30 per cent modulation at 400Hz). Injected into the car aerial socket via 400 Ω dummy aerial should require not more than the following input levels: M.W.: 600kHz (23μV), 1 MHz (9μv) and 1500kHz (4·5μV). L.W.: 174kHz (32μV) and 260kHz (10μV).

Amplifier Tests: Test gear required: (1) C.R.O. (2) A.F. generator (600 Ω). (3) Output meter (15 Ω). (4) D.C. voltmeter (0–10 V). (5) D.C. milliammeter (0–10mA).

Static Voltages (Amplifier): Measured with Avo 8.

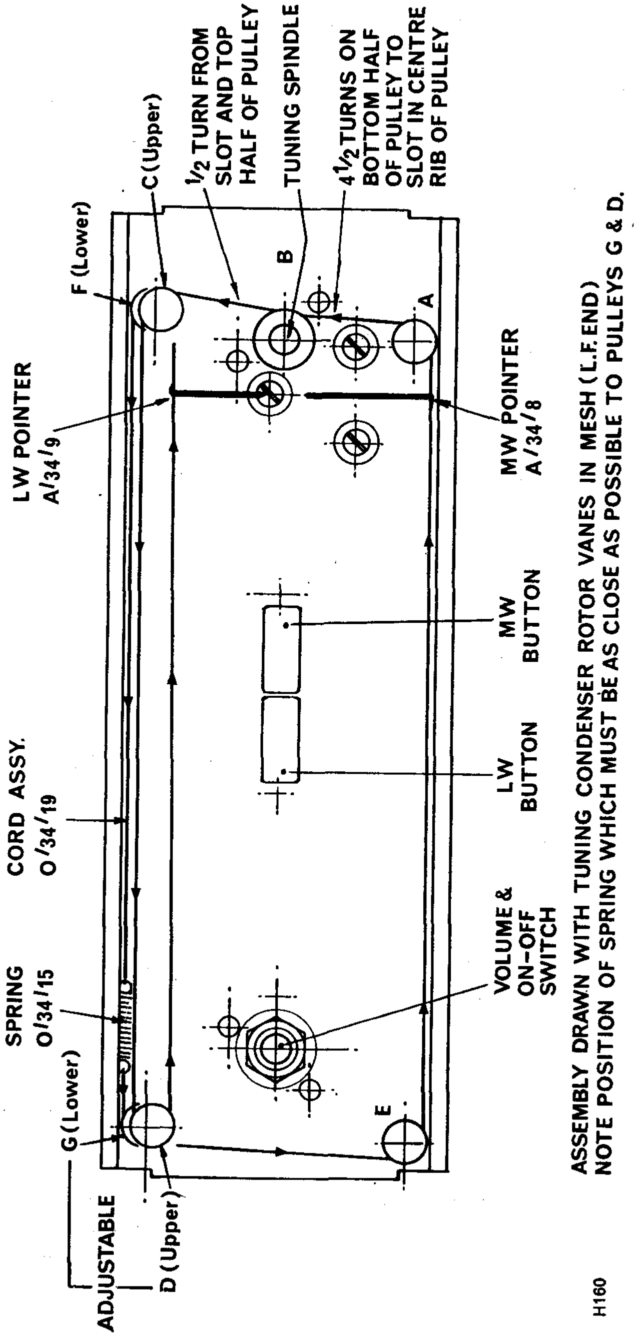
	TR1	TR2	TR3	TR4	TR5
Vce	8·5 V	0·28 V	9·2 V	9·2 V	8·8 V
Vcb	7·6 V	0·25 V	9·0 V	9·1 V	8·55 V
Vbe	0·625 V	—	0·125 V	0·13 V	0·13 V

Note that total current consumed by amplifier is 13mA approx.

Static Current Adjustment (Amplifier): Short circuit the input to the amplifier by a link between pin 4 and 5 of SK1. Cut the test link and insert a 0–10mA meter and adjust RV2 for a reading of 3mA. Connect a 0–10 V meter between the mid-point voltage test point (junction of R11 and R12) and adjust RV1 to give a reading of 8·85 V. Remove supply. Remove meters and replace link.

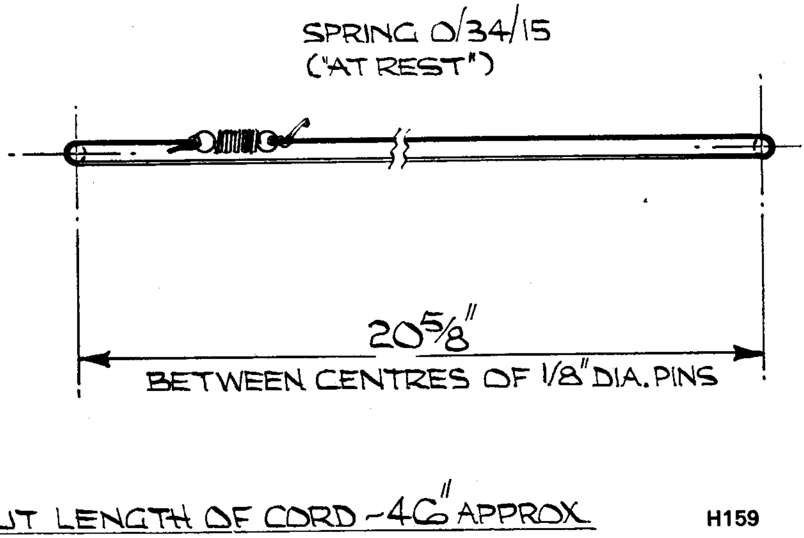
Note: The battery voltage must be 18 V.

Sensitivity (Amplifier): Connect oscilloscope and output meter (15 Ω non-inductive load) to the output terminals of the amplifier. Inject a signal of 1000 Hz into the amplifier input (pins 4 and 5) sufficient to produce an output of 1·25 W without serious distortion as indicated on the oscilloscope. The input necessary to give this output should be approximately 70mV.



(H160) Drive Cord Assembly—Model RP34

Frequency Response (Amplifier): With conditions the same as for the sensitivity test, reduce the audio signal generator output to give an amplifier outputof 100 mW (1000 Hz). Changes in input frequency should produce the following results: 1 kHz (0 dB = 100 mW), 100 Hz (plus 4 dB) and 20 kHz (minus 6·5 dB).



(H159) Drive Cord—Model RP34

Drive Cord Replacement: The control knobs must first be removed by gently pulling them off the volume and tuning control shafts. Remove the four Phillips screws and the scale may then be simply lifted off, and the old cord removed.

If a ready-made cord is not available one may be made by cutting a length of nylon cord to approx 46 in. Each end of this cord must be knotted to the spring to form continuous loop, which when loosely pulled, measures 20⅞ in. Hold the receiver with the front panel facing and the tuning condenser fully closed on the right-hand side.

Take the cord and place it round the top left-hand rear pulley with the spring just to the right. Feed the cord down and around the bottom left-hand pulley, place 4½ anticlockwise turns round the rear section of the drive spindle starting from the back, pass this through slot in the centre. One turn round front section up and round top right-hand rear pulley along to left-hand front pulley and finish round top right front pulley. Replace pointers so that with the gang fully closed they line up with the right-hand end (low frequency) of the tuning dial.

HACKER HERALD Model RP35

General Description: Portable radio receiver with 10 transistors and 1 crystal diode. Aerial, 10 in. ferrite rod. I.F., 470kHz. Output, 1·5W. Speaker: elliptical, 15Ω. Batteries, 2 × PP9. Quiescent battery current, 18mA approximately.

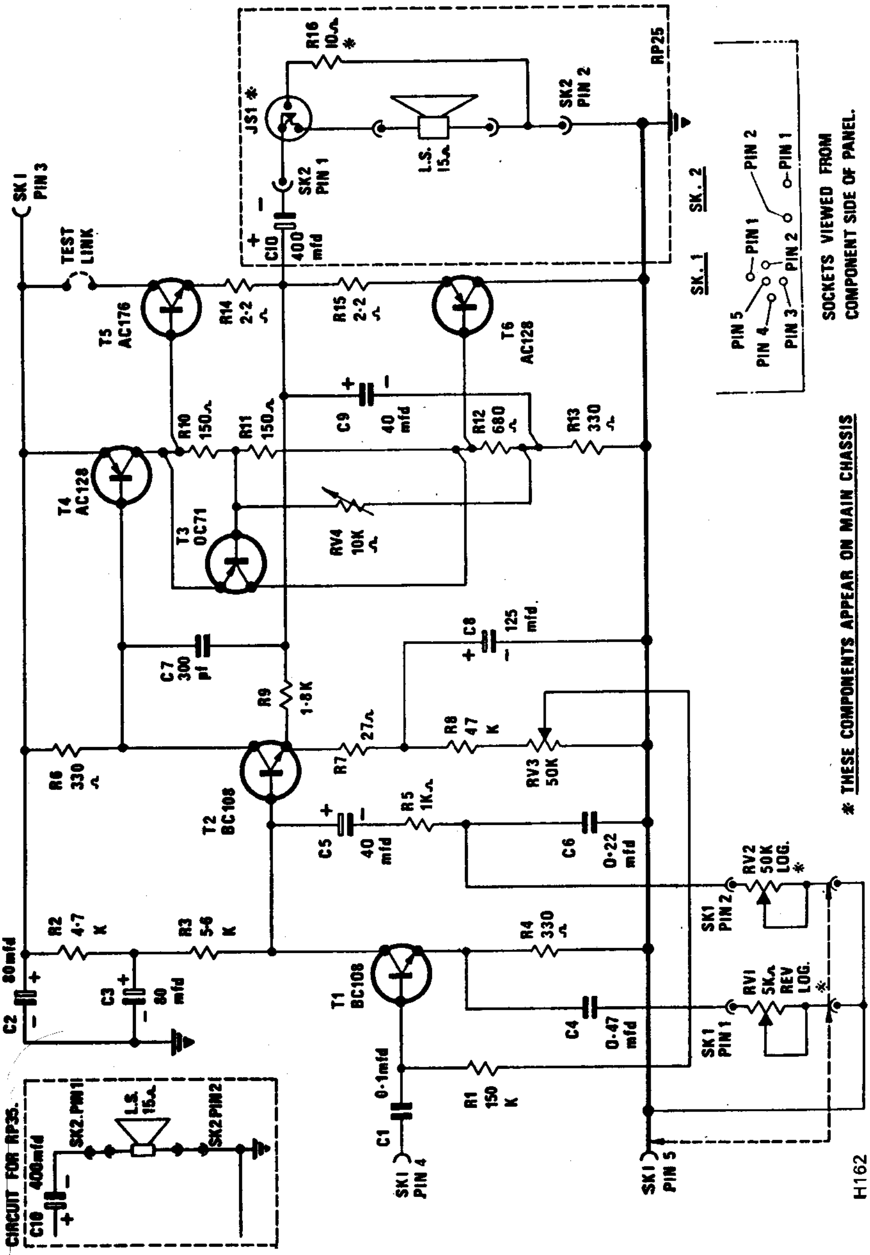
Wavebands: M.W.: 185–580 metres. L.W.: 1070–1840 metres.

Circuit Description (Tuner): Signals are picked up on the ferrite rod aerial tuning L3 (a and b) by GC1 and TC1 on medium wave, and L4 by GC1, C4 and TC2 on long wave. They are fed to the base of T2 (AF117) via C7. ·01 mfd. T1 operates as local oscillator with L5, C9 GC2 on medium wave supplemented by C10 and TC4 on long wave. L6 is the first I.F. transformer. AGC is applied to T2 via R5 from CR1. If signals appearing at the base of T3 (AF117) are amplified and fed to L7 which in turn feeds T4 (AF117) the first I.F. amplifier. L8, the third I.F.T. incorporates CR1 detector and after filtering by C20, R14 and C22, the audio signal is passed to the volume control via the tape output socket and C11/R17. The D.C. component provided by CR1 is used as AGC and fed via R11 and L6 also R5 to control the gain of T2 and T3.

Circuit Description (Amplifier): The circuit employs 6 transistors D.C. coupled with a high A.C. and D.C. feedback loop. The amplifier is operated in Class B single ended push–pull output. Phase inversion is achieved by the complimentary output pair. Overall feedback both A.C. and D.C. is applied to T2 via potential divider networks R9, R7, C8 and R7, R8 and RV3 respectively. T1 is direct coupled to T2 with D.C. feedback derived via RV3 and R1. Frequency compensation is achieved between T1 and T2. H.F. by frequency selective feedback C4 and RV1. L.F. by loss network R5, C6 and RV2. The signals are fed to the amplifier via pin 4 of SK1 to 5 pin socket on the amplifier board. The speaker impedance is 15 Ω and a safety resistance (R16) is included in the external speaker circuit to avoid damage by an accidental short circuit occuring in the external speaker leads.

Removal from Case: Open back by pushing top edge outwards with the thumbs and remove the batteries. Lay receiver face downwards on a soft, level surface. Remove handle by pushing downwards from vertical position. Pull out the 5-pin plug from the amplifier socket and unplug speaker leads. Then take out the special handle fitting screws from outside of case and also the two 4BA screws retaining chassis to inside of case, taking care not to lose the washers. The main chassis may now be removed from the top without difficulty. If necessary, the amplifier can be taken out by removing the two 4BA retaining nuts and washers. It is necessary to remove the amplifier before the speaker can be removed. Do not overtighten speaker nuts when re-assembling as damage can easily be caused to the high density speaker which has a very small speech coil gap.

Replacement of Push-Button Switch: This component is of rigid design and should give little trouble. If replacement is necessary, considerable care must be taken in removing the switch to avoid damage to the printed circuit



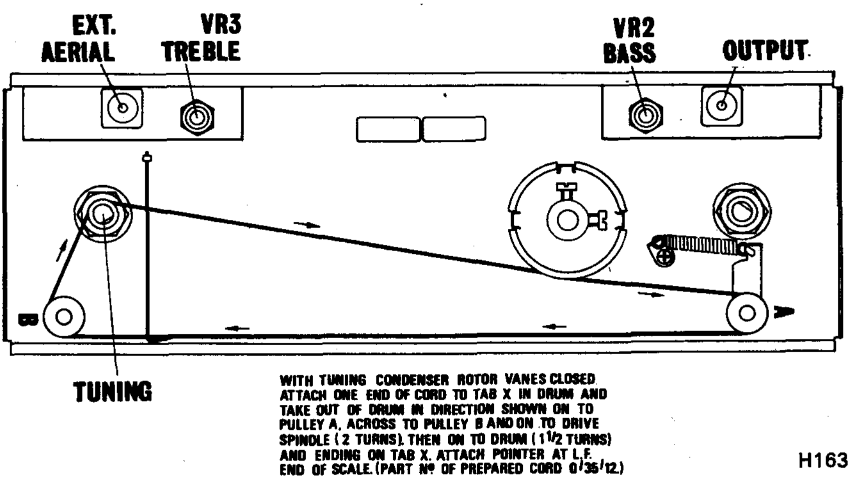
(H162) Circuit Diagram of Amplifier—Model RP35

board. It is necessary to remove all solder from the connecting pins before attempting to take the switch out. This operation is facilitated by the use of a solder "sucker". It is very important to position the new switch correctly on the printed board and a spacing jig consisting of a small piece of 16 gauge aluminium or brass giving a clearance of $\frac{1}{16}$ in. which will ensure that sufficient spacing is left between the body of the switch and the circuit board.

Replacement of Ferrite Rod: Replacement of this item must always be followed by R.F. re-alignment, an important feature of which is correct positioning of the coils on the ferrite rod. The correct position of the M.W. coil is such that the tags of the coil are in the physical centre of the rod, i.e. 5 in. from the end.

Replacement of I.F. Transformers: When any I.F. transformer is replaced I.F. re-alignment will be necessary. The I.F. transformers are aligned visually in the factory and therefore should not just simply be peaked for maximum output. Instability is likely to result if the circuits are peak tuned.

Replacement of Speaker: Extreme care must be observed in replacing the speaker to avoid damaging the cone. Damage such as jammed speech coils or damaged cones are normally due to bad handling.



(H163) Drive Cord Assembly—Model RP35

Static Voltages (R.F./I.F. Panel): Static voltages measured with respect to H.T.+ (18 V), i.e., at positive terminal of C21. Voltmeter, Avo 8. Supply voltage 18 V. Receiver switched to M.W.

		C	B	E
AF117	T1	−8·0	−1·25	−1·1
AF117	T2	−8·0	−1·0	−0·9
AF117	T3	−8·0	−1·05	−0·9
AF117	T4	−8·0	−1·7	−1·5

Oscillator Drive: Measured with valve voltmeter between T1 emitter and chassis. M.W. (80–100 mV) and L.W. (60–80 mV.)

Alignment and Sensitivity Checks: *Test gear required:* (1) A.M. signal generator covering 470kHz, 600kHz, 1000kHz, 1500kHz, 174kHz, 260kHz. (2) Valve voltmeter. (3) Wobbulator covering 470kHz). (4) Oscilloscope. (5) Shielded radiating loop.

The latter item consists of a length of copper or brass tube of a diameter suitable to clear 3 strands of 20swg P.V.C. wire or similar. The tube is bent into a circle of approximately 10 in. diameter and the two ends pass through a copper or brass box approximately 2·5 in. square, the latter having one open side. The tube is insulated at one end and from the box by a suitable rubber grommet and the other end soldered to the box. The lead from the signal generator should be screened and the braid soldered to the same point to which the tube is soldered. Three turns of 20swg P.V.C. wire or similar is then fed through the tube and one end also soldered to the box. The other end must go via a 405 Ω 1 per cent resistor to the inner of the screened lead from the generator. The loop should be placed at 90° to the ferrite rod aerial in the receiver with approximately 24 in. between centres for all R.F. alignments.

I.F. Alignment: Connect oscilloscope across V/C and inject wobbulator and marker signals (470kHz) across L3 (medium wave aerial coil). Switch receiver to M.W. and close gang. Adjust instruments to give reasonable display on the oscilloscope, making sure that the input is kept as low as possible in order to avoid overloading and the effect of A.G.C. action. Adjust the cores of L6, L7 and L8 to obtain an even response curve with $\pm$3kHz approx. 4dB down at either side of the centre frequency of 470kHz.

R.F. Alignment:

1. Check pointer datum. The centre of the pointer must coincide with the edge of the right-hand end of the frequency scale when the tuning gang is just brought up to the fully enmeshed position from open. It is important that the adjustment is checked before alignment of the R.F. circuits is commenced.

2. Fix L3a in the centre of the ferrite rod so that the start of the coil is 5 in. from the end of the rod.

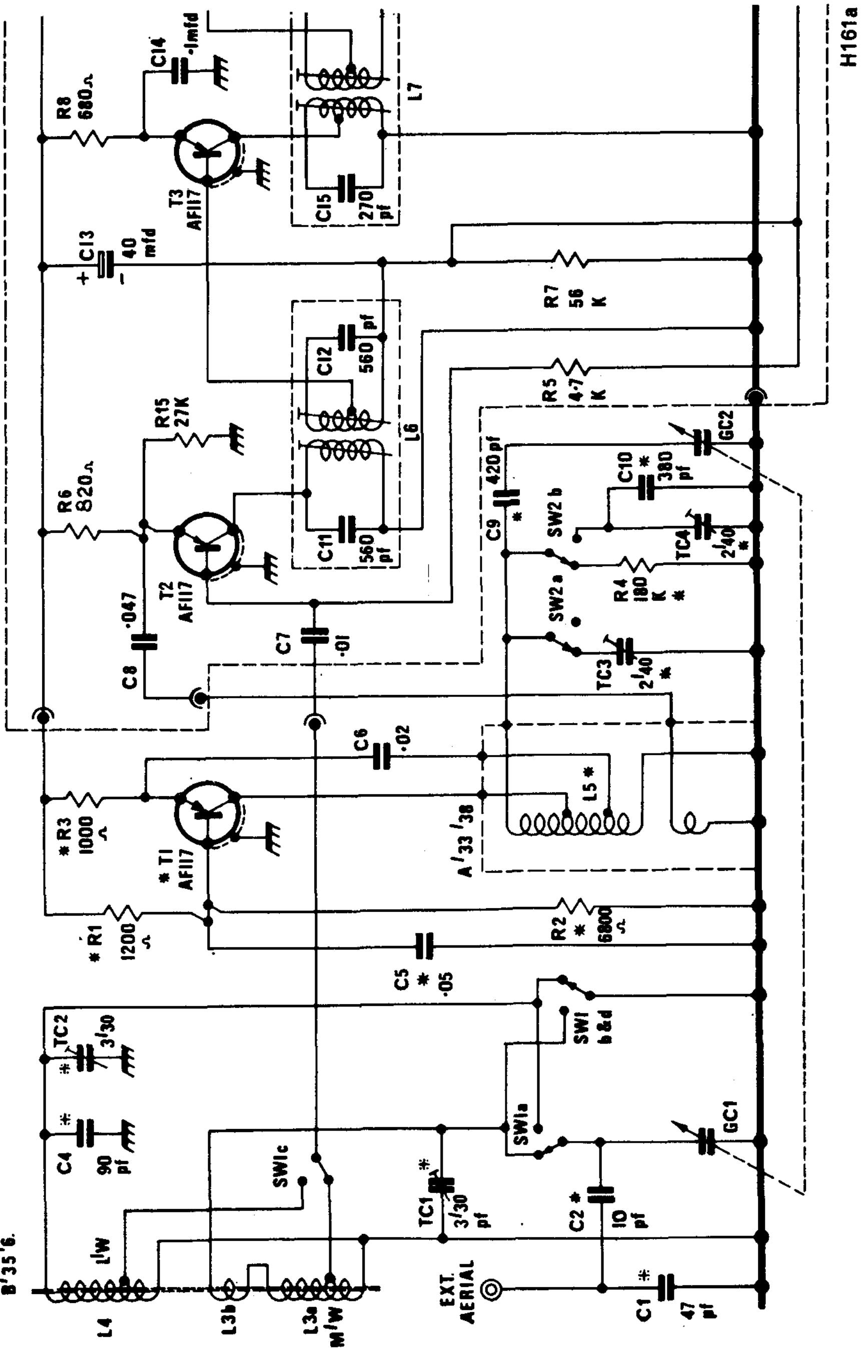
3. Switch the receiver to M.W. and set pointer to 600kHz (500 metres). Inject a signal from A.M. generator via loop at 600kHz and adjust core of oscillator (L5) to give the maximum signal as indicated by oscilloscope or output meter connected to output. (Be careful to avoid overloading by using excessive input signal.)

4. Inject via the loop a signal of 1500kHz and tune the receiver to the 1500kHz (200 metre) mark on the scale. Adjust TC3 for maximum output. Repeat 3 and 4 until calibration is accurate.

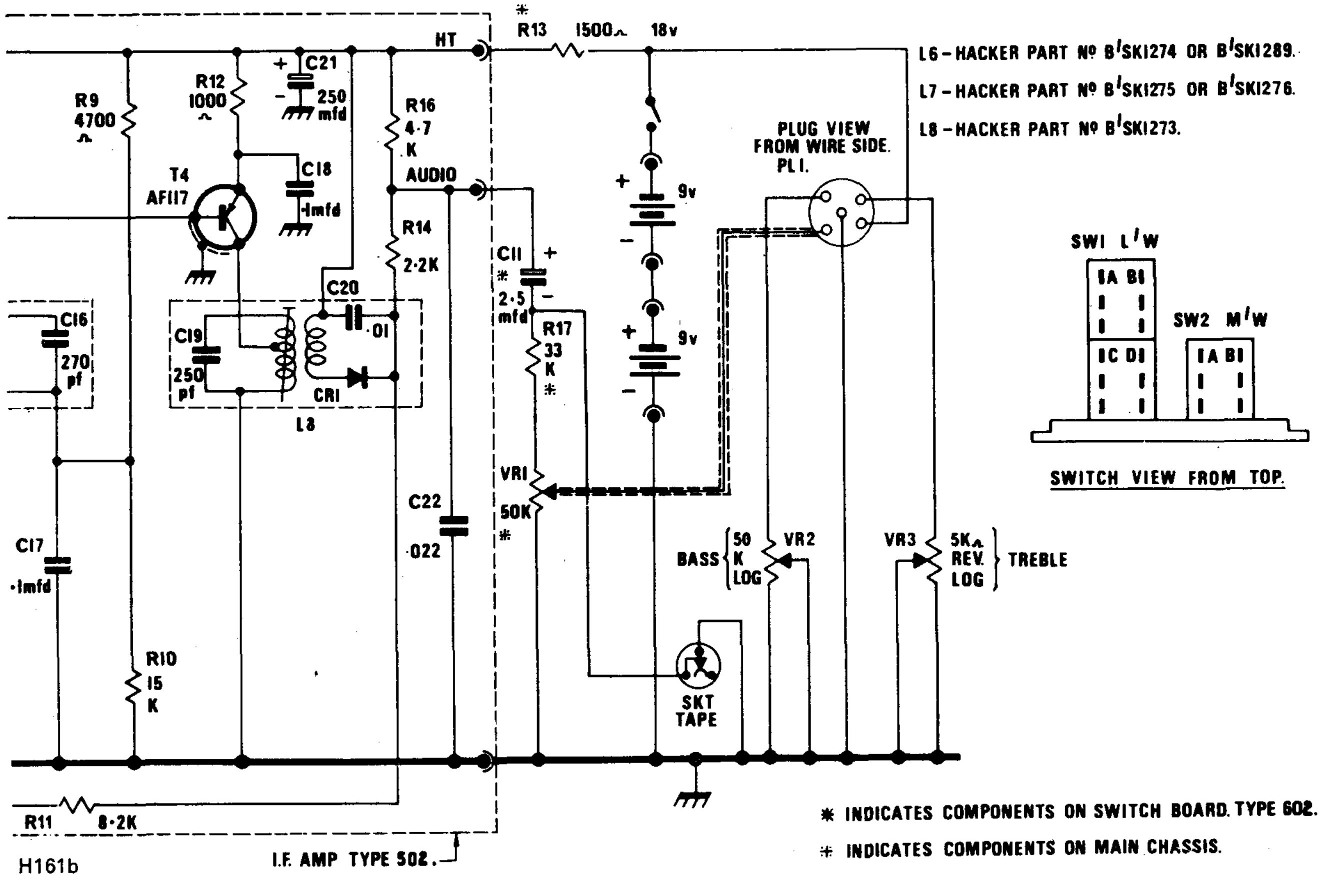
5. Inject via the loop at 600kHz signal and with the receiver tuned to the 600kHz (500 metre) mark on the scale adjust the position of the M.W. coil L3b on the ferrite rod to give maximum output.

6. Retune receiver and generator to 1500kHz (200 metres) and adjust TC1 for maximum output. Repeat 5 and 6 until no further improvement can be obtained.

7. Switch the receiver to L.W. Tune in the B.B.C. 2 on 200kHz (1500 metres) and adjust TC4 for maximum output.



(H161a) Circuit Diagram of Tuner—Model RP35 (Part)



(H161b) Circuit Diagram of Tuner—Model RP35 (Continued)

8. Inject, via the loop, a signal of 174kHz (1718 metres) and tune the receiver to this frequency. Adjust the position of the L.W. coil (L4) on the ferrite rod, for maximum output.

9. Inject, via the loop, a signal of 260kHz (1154) metres) and tune the receiver to this frequency. Adjust TC2 for maximum output. Repeat 8 and 9 until no further improvement can be obtained.

10. Fix the coils carefully in position on the ferrite rod with adhesive tape.

I.F. Sensitivity: Measured with receiver switched to M.W. and gang closed. With signal generator (10 Ω source) adjusted to 470kHz (30 per cent modulation at 400 Hz) connected across L3b (M.W. aerial coil) and valve voltmeter connected across VR1, adjust generator output to give 24 mV on valve voltmeter. The generator output to give the reading should not exceed 30 μV.

R.F. Sensitivity: For the same valve voltmeter reading (25 mV) a signal at R.F. (30 per cent modulation at 400 Hz), injected into the car aerial socket via 400 Ω dummy aerial should require not more than the following input levels: M.W.: 600kHz (23 μV), 1 MHz (9 μV) and 1500kHz (4·5 μV). L.W.: 174kHz (32 μV) and 260kHz (10 μV).

Amplifier Checks: *Test Gear required:* Avo 8, A.F. generator, output meter (15 Ω non-inductive load) and oscilloscope.

Amplifier Static Voltages:

		Vce	Vcb	Vbe
BC108	T1	9·6 V	—	0·525 V
BC108	T2	8·5 V	7·6 V	0·625 V
OC71	T3	0·28 V	0·25 V	—
AC128	T4	9·2 V	9·0 V	0·125 V
AC176	T5	9·2 V	9·1 V	0·13 V
AC128	T6	8·8 V	8·55 V	0·13 V

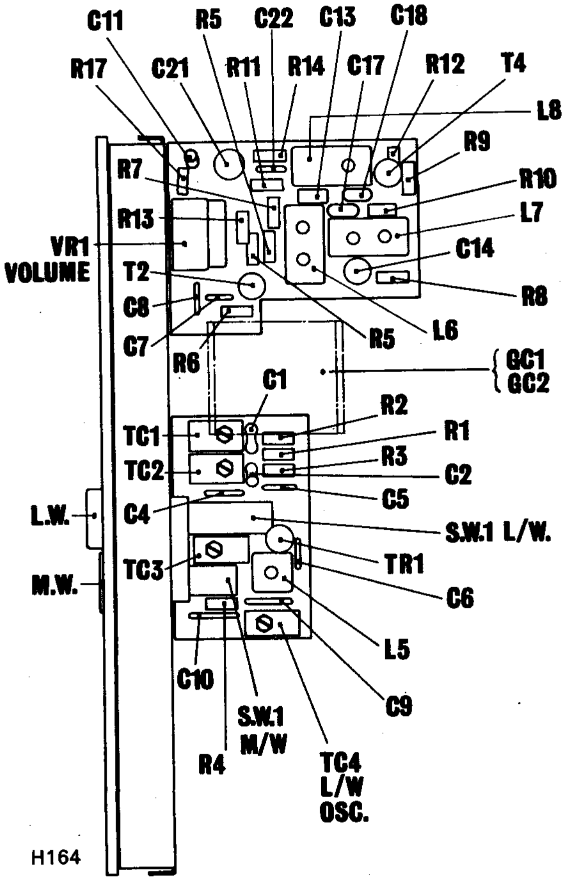
Note that total amplifier current is equal to 13¾ mA approximately.

Amplifier Static Current Adjustment: Short circuit the input to the amplifier by a link between Pin 4 and 5 of SK1. Cut the test link and insert a 0–10 mA meter. Connect supply. Adjust RV4 to give a current reading of 3 mA. Connect a 0–10 V meter between the mid-point voltage test point (which is the junction of R14 and R15) and Earth (negative to Earth). Adjust RV3 to give a mid-point voltage of 8·9 V. Disconnect supply. Remove meters, replace link and remove short circuit from input.

Amplifier Sensitivity Measurement: With bass and treble controls set to minimum, connect oscilloscope and output meter (15 Ω N.I.L.) to the output terminals of the amplifier. Inject a signal of 1000 Hz into the amplifier input (pins 4 and 5), sufficient to produce an output of 1·2 W without serious distortion as indicated on the oscilloscope. The input necessary to give this output should be approximately 36 mV ($\pm$2 dB).

Note: It may be noticed that some uneven clipping of the waveform occurs near the rated power output, if so, adjust RV1 slightly to produce even clipping.

Amplifier Frequency Response: With conditions the same as for the sensitivity test, reduce audio signal generator output to give amplifier output of 10 mW (Odb). Changes in input frequency should produce the following results: 1 kHz (0 dB), 100 Hz (minus 1 dB) and 20kHz (minus 1·25 dB).



(H164) Layout Details—Model RP35

Amplifier Treble and Bass Control Checks: The tone controls provide bass and treble lift only. With conditions as in previous test, rotate treble control to maximum (bass at minimum). Change in input frequency should produce the following results: 20kHz (plus 14dB), 10kHz (plus 14·5dB), 6kHz (plus 10·75dB), 2kHz (plus 4dB) and 1kHz (0dB).

Now rotate bass control to maximum (treble to min. position). Change in input frequency should produce the following results: 1kHz (0dB), 500Hz (plus 2·5dB), 200Hz (plus 10·75dB), 40Hz (plus 10dB) and 20Hz (plus 3dB).

Note: 0dB = 10mW output.

Amplifier Noise: With bass and treble controls set to maximum with input open circuit, the figure is greater than −60dB on 1·2W.

Amplifier Stability Test: With no input to the amplifier but with output meter or speaker connected, connect oscilloscope to output terminals and note that no spurious oscillations are visible on trace.

HALCYON Corvette

General Description: Portable radio receiver with 8 transistors and 1 diode. Internal ferrite rod aerial. Sockets for tape, earphone and car aerial. When earphone plug is inserted the internal speakers are muted.

Wavebands: M.W. 176–560 metres. L.W.: 1200–2000 metres.

Alignment: *Equipment required:* (1) A.M. signal generator (155–1700kHz), (2) Coupling loop, (3) Output meter ($8\,\Omega$).

(*a*) Check that with gang fully open, pointer is at left-hand end of scale window. Connect sig. gen. to coupling loop and place loop near receiver in same plane as that of ferrite rod aerial. Use minimum signal input level consistent with usable output 50–100mW.

(*b*) With gang fully out on M.W. inject 475kHz and adjust I.F.T. A, B and C for max. output.

(*c*) Tune to 500 metres and inject 600kHz. Adjust oscillator coil and L2 (slide on rod) for max. output.

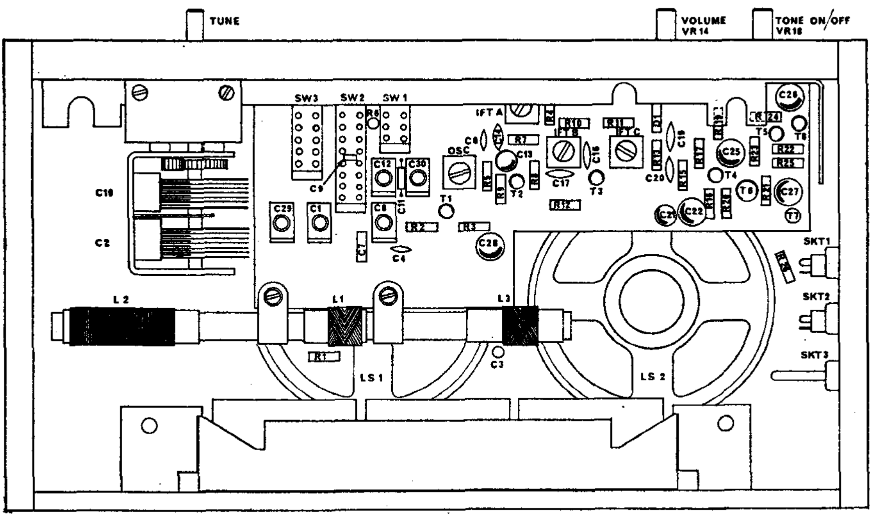
(*d*) Tune to 200 metres and inject 1500kHz. Adjust C30 and C29 for max. output.

(*e*) Repeat (*c*) and (*d*) until no further improvement can be made.

(*f*) Switch to bandspread and tune to LUX. Inject 1439kHz and adjust C8 and C1 for max. output.

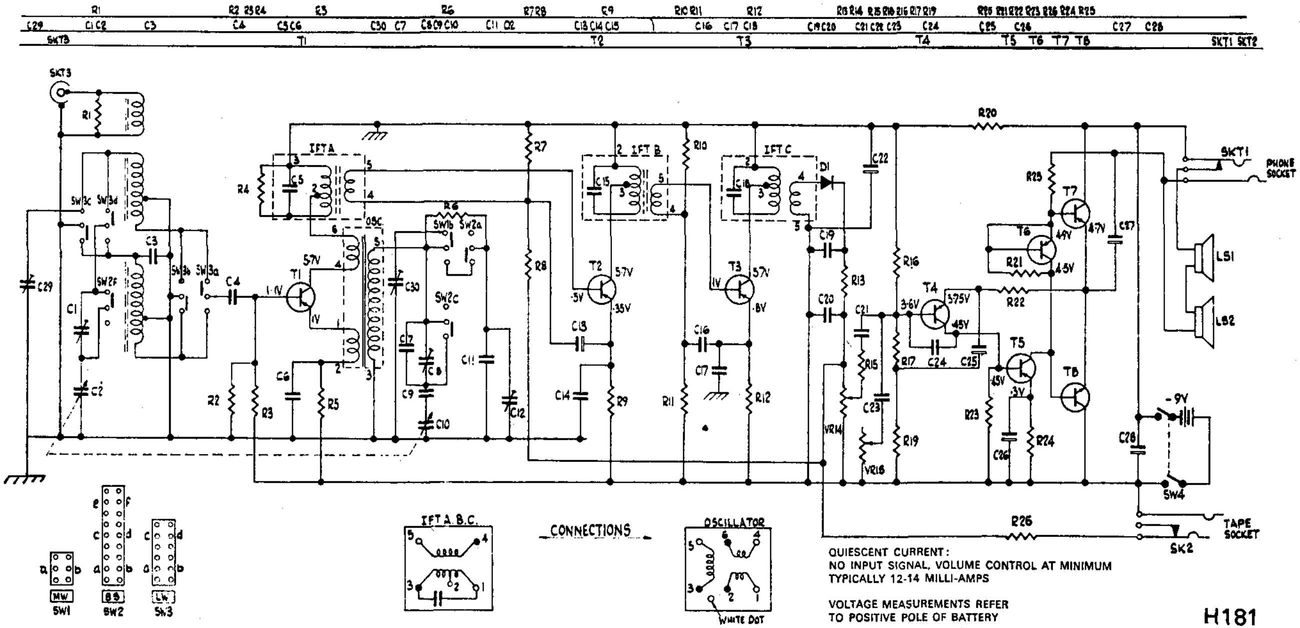
(*g*) Switch to L.W., tune to 1500 metres and inject 200kHz. Adjust C12 and L3 (slide on rod) for max. output.

(*h*) Lock aerial coils to ferrite rod with a suitable paint.



H182

(H182) Component Locations—Corvette



Transistors
D1—AA121
T2—AF170
T2—AF172
T3—AF172
T4—AC141
T5—AC138
T6—10822
T7—AC141
T8—AC142

Coils
LS1—Loudspeaker 8 Ω
LS2—Loudspeaker 8 Ω
I.F.T.A.
I.F.T.B.
I.F.T.C.
Osc. coil

Miscellaneous
SW1 —M.W. switch
SW2 —Bandspread switch
SW3 —L.W. switch
SW4 —OFF/ON switch ganged to VR18
SKT1—Phone socket
SKT2—Tape socket
SKT3—Car aerial socket

(H181) Circuit Diagram—Corvette

Battery Replacement: Remove two screws from back of receiver and lift off back cover bottom edge first. Slide out plastic battery carrier and replace cells. Take care to insert new cells the correct way round. Replace battery carrier and back cover.

Removal of Chassis: 1. Remove knobs from rotary controls only. 2. Unscrew three sleeved nuts from rotary controls. 3. Unsolder wires from loud speakers and sockets.

Resistors
R1 —10kΩ
R2 —27kΩ
R3 —6·8kΩ
R4 —100kΩ
R5 —1kΩ
R6 —100kΩ
R7 —100kΩ
R8 —10kΩ
R9 —680Ω
R10 —27kΩ
R11 —5·6kΩ
R12 —560Ω
R13 —470Ω
VR14—5kΩ log
R15 —2·2kΩ
R16 —8·2kΩ
R17 —15kΩ
VR18—20kΩ Log D.P.S.T.
R19 —10Ω Switch
R20 —1kΩ
R21 —100Ω
R22 —2·2kΩ
R23 —1·5kΩ
R24 —39Ω
R25 —510Ω
R26 —2·2kΩ

Capacitors
C1 —3–30pf trimmer
C2 —228pf variable
C3 —68pf
C4 —0·01µf
C5 —190pf
C6 —0·01µf
C7 —20pf
C8/C12 3-30pf Trimmers
C9 —200pf
C10 —228pf variable
C11 —210pf
C13 —50µf
C14 —0·02µf
C15 —190pf
C16 —0·02µf
C17 —0·02µf
C18 —190pf
C19 —0·01µf
C20 —0·02µf
C21 —0·5µf
C22 —100µf
C23 —0·1µf
C24 —0·02µf
C25/26 100µf (each)
C27/28 100µf (each)
C29 —3–30pf trimmer
C30 —3–30pf trimmer

HALCYON — County Ten and Coronado

General Description: Portable radio with 8 transistors and 1 diode. Ferrite rod aerial. Earphone socket (the internal loudspeaker is muted when earphone plug is inserted).

Wavebands: M.W.: 176–560 metres. L.W.: 1120–1940 metres.

Alignment: Equipment required: (1) A.M. signal generator covering the range 155–1700kHz. (2) R.F. coupling loop. (3) Output meter (8Ω).

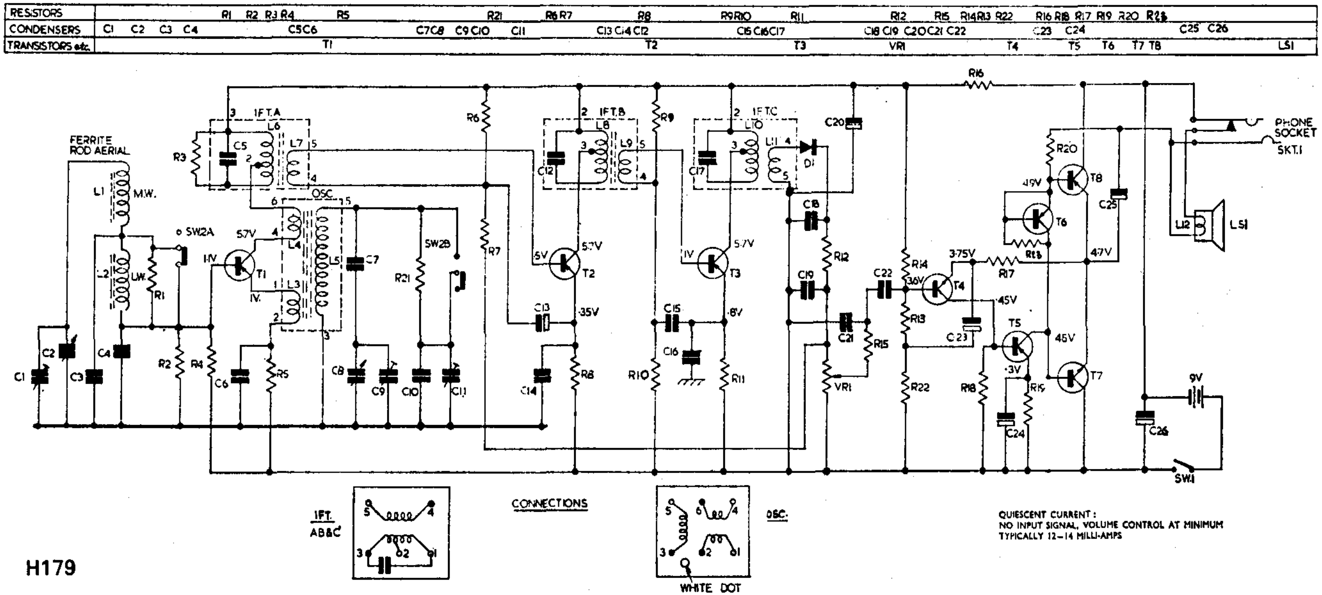
(*a*) Check that with gang fully open, pointer is set at left-hand end of scale window. Then connect sig. gen. to coupling loop and place loop near receiver, in same plane as ferrite rod. Use minimum signal input level, consistent with a usable output indication 50–100mW.

(*b*) With gang fully out on M.W. inject 475kHz and adjust I.F.T. A, B and C for max. output.

(*c*) Tune to 500 metres and inject 600kHz. Adjust oscillator coil and L1 for max. output.

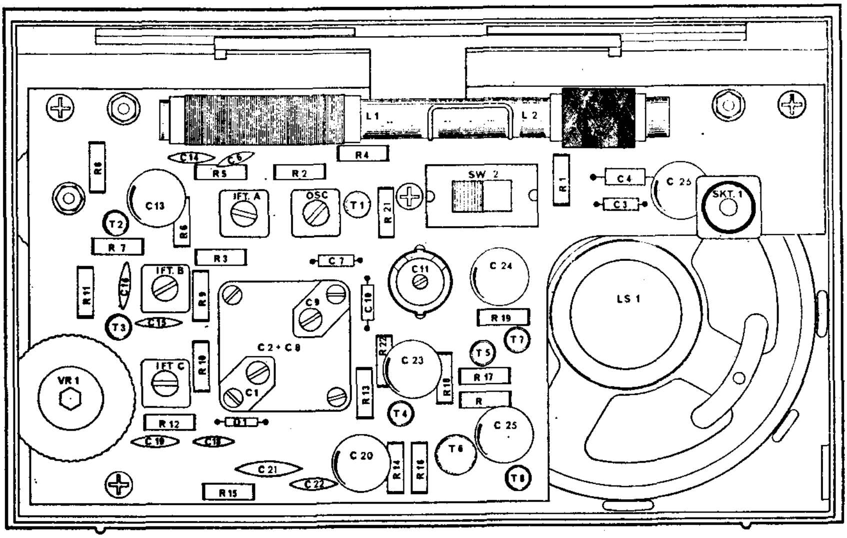
(*d*) Tune to 200 metres and inject 1500kHz. Adjust C9 and C1 for max. output.

(*e*) Repeat (*c*) and (*d*) until no further improvement can be made.



Resistors			Capacitors		
R1—100kΩ	R9—27kΩ	R17—2·2kΩ	C1—2–10pf trimmer	C9—2–10pf trimmer	C18—0·01 μf
R2—27kΩ	R10—5·6kΩ	R18—1·5kΩ	C2—5–280pf variable	C10—210pf	C19—0·02 μf
R3—100kΩ	R11—560Ω	R19—39Ω	C3—105pf	C11—3–30pf trimmer	C20—100 μf
R4—6·8kΩ	R12—470Ω	R20—510Ω	C4—2000pf	C12—190pf	C21—0·05 μf
R5—1kΩ	R13—15kΩ	R21—100kΩ	C5—190pf	C13—50 μf	C22—0·47 μf
R6—100kΩ	R14—8·2kΩ	R22—10Ω	C6—0·01 μf	C14—0·02 μf	C23—100 μf
R7—10kΩ	R15—5·6kΩ	R23—100Ω	C7—250pf	C15—0·02 μf	C24—100 μf
R8—680Ω	R16—1kΩ	VR1—5kΩ log and SP switch	C8—5–280pf variable	C16—0·02 μf	C25—100 μf
				C17—190pf	C26—100 μf

(H179) Circuit Diagram—County Ten and Coronado



(H180) Component Locations—County Ten and Coronado

(*f*) Switch to L.W. Tune to 1500 metres and inject 200kHz. Adjust C11 and L2 for max. output.

(*g*) Lock aerial coils to ferrite rod with a suitable paint.

Note: L1 and L2 are adjusted by sliding on ferrite rod.

Battery Replacement: Remove back cover by twisting coin in slots at bottom edge. Renew battery and replace back cover, insert top edge first. *Important:* Make sure receiver is switched off when changing battery, otherwise transistors may be damaged.

Removal of Chassis: Remove back cover and unsolder speaker leads. Remove four chassis fixing screws and lift chassis from cabinet.

Transistors
T1—AF170
T2—AF172
T3—AF172
T4—AC141
T5—AC142
T6—10822
T7—AC141
T8—AC142
D1—AA121

Coils
L1, L2—M.W./L.W. AE coil
L3, L4, L5—Osc. coil
L6, L7—I.F.T.A.
L8, L9—I.F.T.B.
L10, L11—I.F.T.C.
L12—Voice coil 8Ω

Miscellaneous
SW1—OFF/ON ganged to vol. cont.
S2 A and B—Wave change switch
SKT1—Phone jack socket

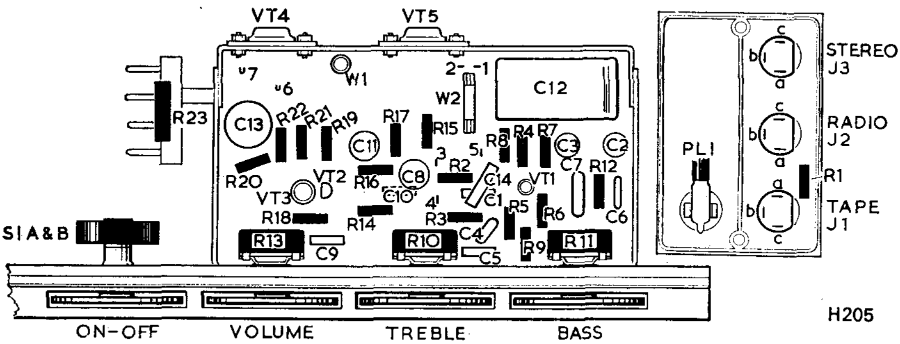
H.M.V. — Model 2038

General Description: This model is basically similar to the Ultra model 6024, which is described in this volume.

H.M.V. Model 2040

General Description: Record player with 5W output. Mains supply: 200–250V, A.C., 50Hz. Loudspeaker: elliptical, 8Ω. Sockets: radio input, stereo output (left-hand channel) and tape recording output. Record changer: BSR UA55 with BSR C1 cartridge, and turnover stylus assembly ST3.

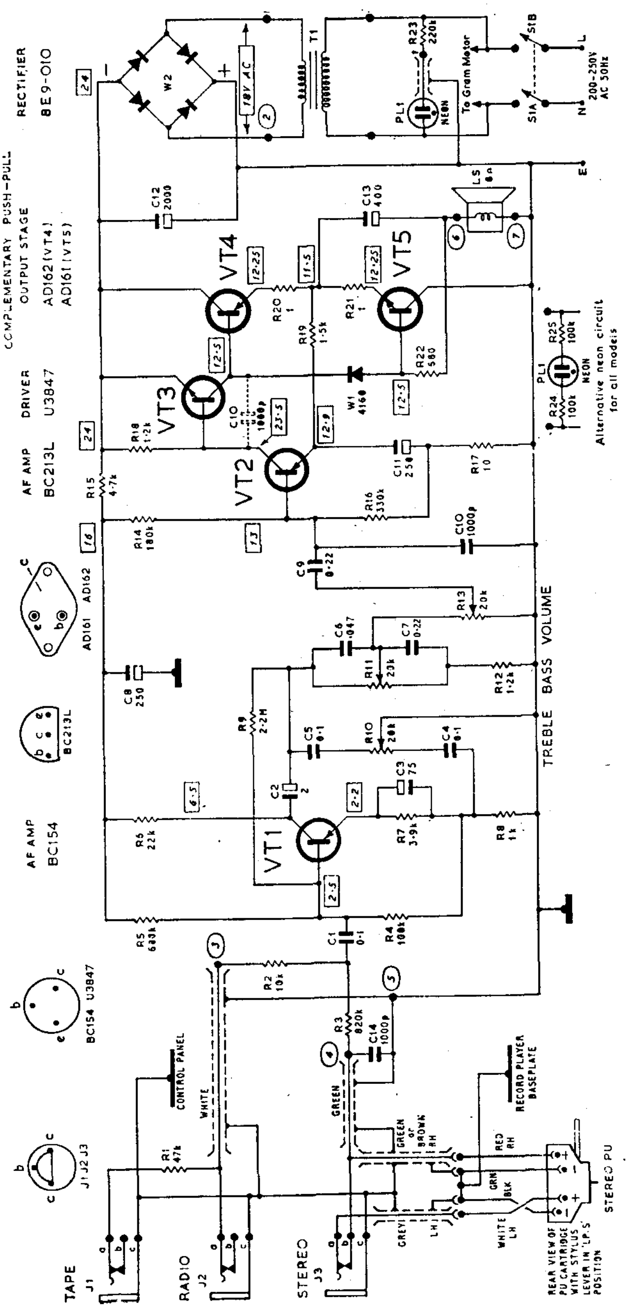
Record Changer Removal: Remove ventilation panel (2 screws) from record changer compartment. Turn transit screws fully anticlockwise to lock record changer then remove single plated screw from centre of cabinet back and two screws from underside of cabinet (securing front feet). Grip transit screws to lift record changer and stand it on edge diagonally across cabinet floor. For complete removal, detach transformer and pick-up lead clamps, unplug pick-up leads (after taking note of colour coding) and unsolder amplifier leads from mains transformer.



(H205) Component Locations—H.M.V. 2040

Chassis Removal: Remove record changer as described then take out plated screw from each end of escutcheon plate. Slip a thin card between escutcheon plate and sides of cabinet to protect the latter when removing or replacing escutcheon plate and chassis. The amplifier chassis and record changer assembly in Model 4028 can now be lifted clear of the cabinet. For complete removal of the amplifier chassis and record changer assembly in Model 2040, also release bracket from back of control panel (2 screws) and pass the panel through front of cabinet. When reassembling, do not omit to refit chassis lead tags under one of the screws securing chassis and control bracket, and refit the bracket with the "U" slot uppermost.

Stylus Replacement: To remove worn styli assembly, turn the indicator flag to either L.P. or 78 position. A gentle downward pressure and forward movement on the styli assembly will release it from its mounting. After replacement, ensure that the stylus arm is engaged properly within the V-shaped fork of the cartridge.



H204

(H204) CIRCUIT DIAGRAM—H.M.V. 2040

Cartridge Replacement: Ease forward the small spring clip at front end of pick-up head to release the cartridge then detach plugs from pins at rear of cartridge noting colour coding to ensure correct connections to the replacement.

H.M.V. Model 2150 (9 Volt Version)

General Description: Apart from the differences listed below, the 9 V version is identical to the 18 V version described in the 1968–69 volume. Note that the wiring to the battery compartment is rearranged to connect the two 9 V batteries in parallel.

List of Resistors, Capacitors, etc.

Resistors: All 10 per cent tolerance, ¼ W carbon unless stated.

Ref.	Value	Tol.	Function
R1	560 Ω	5%	VT1 emitter stabilizing
R3	12 kΩ	5%	Part VT1 base bias potential divider
R5	1 kΩ		VT2 emitter stabilizing
R6	22 kΩ		Part VT2 base bias potential divider
R10	2·2 kΩ		Battery load equalizing
R11	33 kΩ		Part VT3 base bias potential divider
R13	1 kΩ		VT3 emitter stabilizing
R16	68 kΩ		VT4 base bias
R20	27 kΩ		Part VT5 base bias potential divider
R23	1 kΩ		VT5 emitter stabilizer
R32	deleted		
R34	220 Ω	5%	D.C. dropper and decoupler
R35	1 kΩ		VT6 collector load
R36	3·9 kΩ		VT6 emitter stabilizing and feedback
R37	680 Ω		VT7 collector load
R38	2·2 Ω	±0·5 Ω	VT9 emitter limiter
R39	2·2 Ω	±0·5 Ω	VT8 emitter limiter

Capacitor

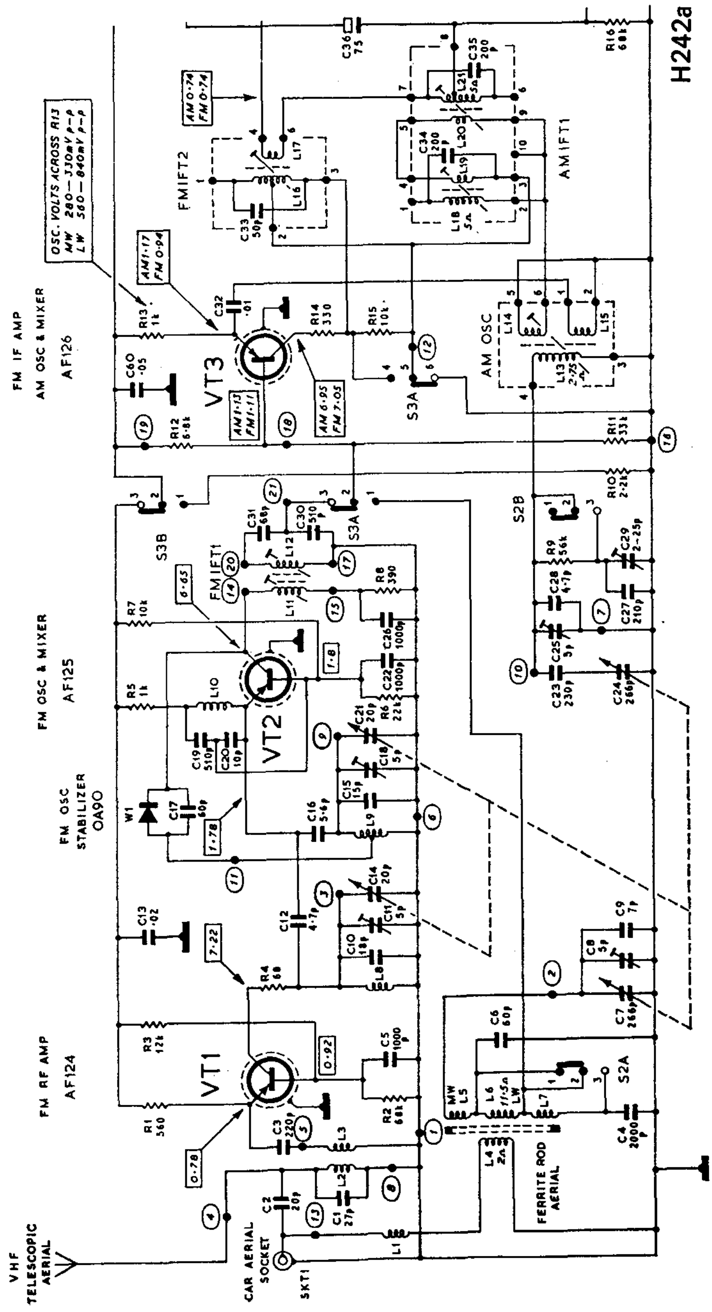
Ref.	Value	Tol.	Rating	Function
C56	2500 pF	20%	500 V	Tone correction

Miscellaneous

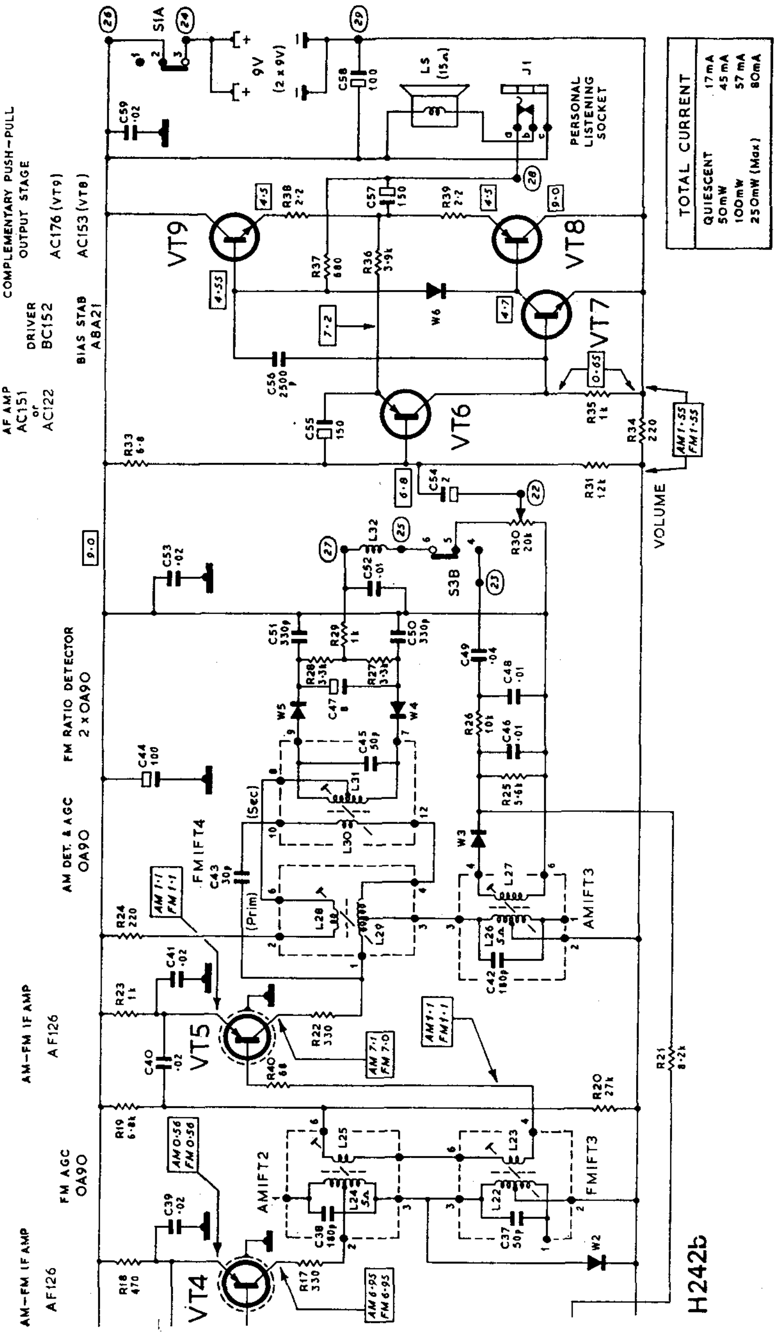
Ref.	Description	
LS	Loudspeaker, 15 Ω	
VT6	A.F. amplifier, Type AC151*	
VT8	Complementary push-pull output pair	Type AC153*
VT9		Type AC176*
W6	Bias stabilizer, Type A8A21*	

**Part of transistor pack LP29*

Circuit Diagram Notes: All voltages were measured with a 20,000 ohm/volt meter and are with respect to the positive supply line of each transistor except where otherwise shown. Ringed figures indicate printed board tag connection points. D.C. resistance readings are shown against inductors where these are 1 Ω or greater.



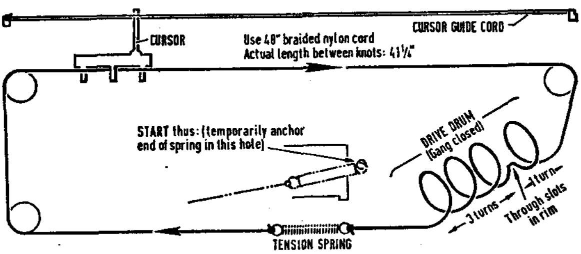
(H242a) Circuit Diagram—Model 2150 (Nine-Volt Version) (Part)



(H242b) Circuit Diagram—Model 2150 (Nine-Volt Version) (Continued)

H.M.V. Model 2332

General Description: Stereo radiogram with a power output of 2 W (continuous tone) per channel. Record changer, BSR UA15 with SX1M cartridge and turnover stylus ST3. Aerials: ferrite rod for M.W. and L.W. and internal dipole for V.H.F./F.M. Sockets: A.M. aerial, F.M. dipole and tape. Mains supply: 200/250 V, A.C., 50 Hz.



(H248) Drive Cord—Model 2332

Wavebands: M.W.: 185–566 metres. L.W.: 1120–2025 metres. V.H.F./F.M.: 87·5–101 MHz.

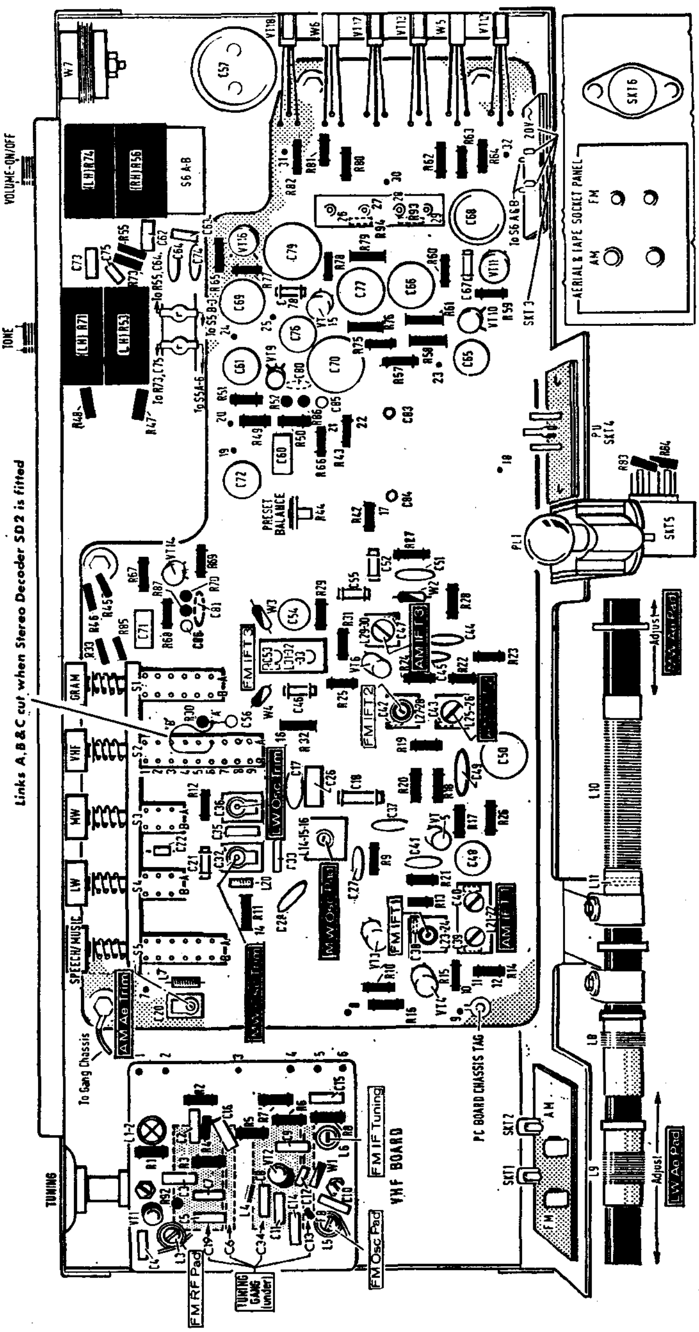
Dismantling (Record Changer Removal): Take out screws and turn swivel clips to release back cover. Unplug pick-up lead from radio chassis and withdraw it through hole in cabinet wall into record changer compartment. Unsolder motor leads from mains transformer mounted on cabinet. With record changer transit screws turned fully clockwise, pivot clips on lower end of transit screws to enable them to pass through motor board, then lift record changer out of cabinet.

Dismantling (Chassis Removal): Pull off rotary control knobs: this is best done by using a length of stout cord as a "puller". Detach back cover, unplug internal F.M. aerial and remove tape/aerial panel from cabinet. Unsolder motor leads from mains transformer then detach latter from cabinet (two 4BA screws, nuts and washers). Release mains lead clamp and unplug connections to chassis (mains transformer, pick-up and loudspeakers). Remove nut (or screw) and washer at lug, located centrally at rear of chassis, pull chassis clear of front locating studs and withdraw through back of cabinet.

Warning: When withdrawing or refitting the chassis, take care to avoid scraping the scale backing paint with the control spindles.

Pick-up Balance: R44 is a pre-set control which balances the left-hand and right-hand outputs from the pick-up and normally, will require adjustment only if the pick-up cartridge is replaced.

Audio Check: Connect a 15 Ω impedance output meter in place of each loudspeaker. Alternatively, examine output waveform on an oscilloscope connected between tag 29 (or tag 26 for left-hand channel) and chassis. Switch to gram and turn tone control fully clockwise. Release speech/music button then connect audio oscillator between tags 22 and 18. Inject a 15–20 mV,



H247

(H247) Component Locations—Model 2332

800 Hz signal and note output: for a correctly functioning amplifier this should be clean, unclipped and approximately 2 W. Transfer input to tags 17 and 18 and similarly check other amplifier.

Tone Control Check: With test conditions as for the audio amplifier check, volume control at maximum, tone control set to the midway position, and the speech/music button released, reduce input of 800 Hz signal to produce 200 mW output: this will require an input of approximately 5 mV. Back off volume control 20 dB, i.e. increase input 20 dB and adjust volume control to reduce output to original level. Inject an 80 Hz audio signal: output should increase by 10 dB. Depress speech/music button and check that output reduces to approximately original level. Inject an 8 kHz audio signal and turn tone control from minimum to maximum: this should produce a variation of 18 dB in output level.

Alignment (General): Remove chassis as described in "Dismantling". Connect an output meter adjusted for 15 Ω impedance in place of left-hand or right-hand loudspeaker or a 20,000 ohm/volt meter set to a suitable A.C. voltage range across the left-hand or right-hand loudspeaker sockets. Zero, trim and pad markers are provided on the scale diffuser.

Alignment (A.M.I.F.): Switch receiver to M.W.: turn gang to maximum capacitance position and volume control fully clockwise. Inject a 475 kc/s, 30 per cent modulated, signal via a 0·1 μF capacitor between contact 5 of switch S5B and chassis, then peak L29, L25, L22 and L21 for maximum output, adjusting signal input level as required to maintain an output level of 200 mW.

Alignment (A.M.R.F.): Align M.W. first. 30 per cent modulated signal should be injected at A.M. aerial/earth socket (SKT2) via a 30 pF series capacitor. With the tuning gang at maximum, check that the cursor coincides with the zero marker on the scale diffuser.

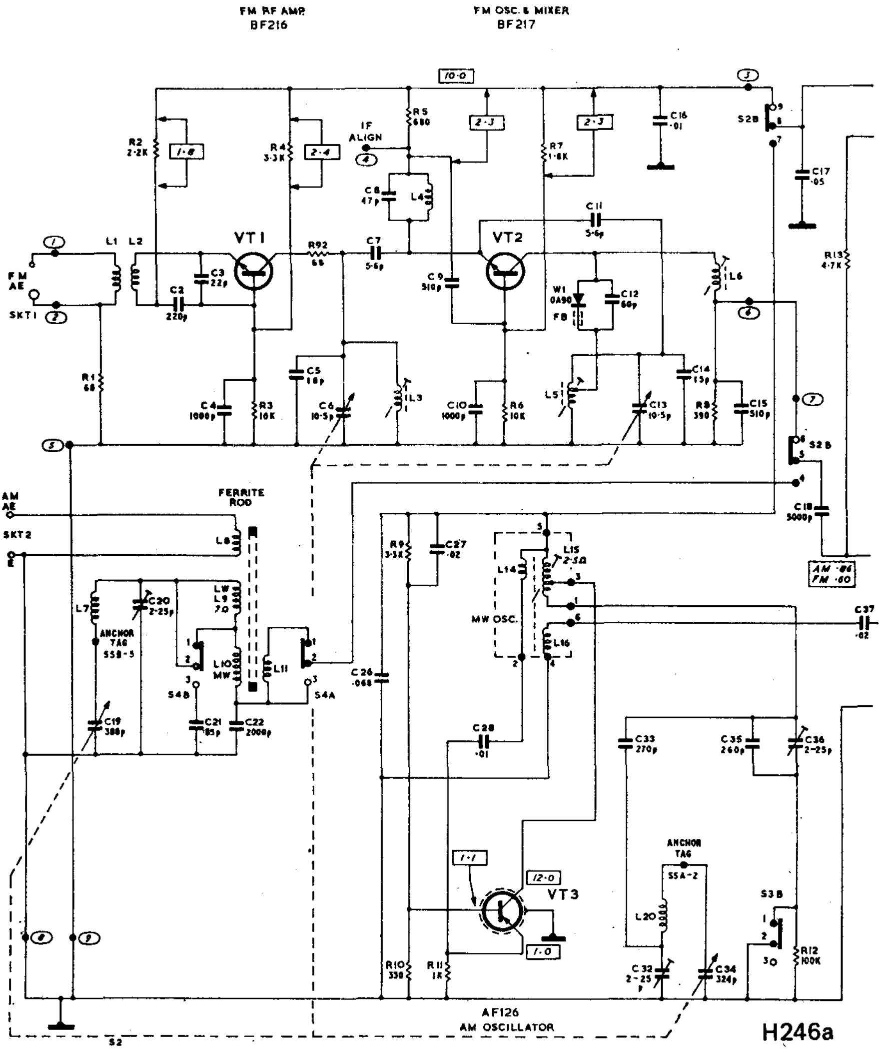
Range	*Frequency*	*Cursor Position*	*Adjust*
M.W.	600 kc/s 1400 kc/s	M.W. pad marker M.W. trim marker	L15, L10* C32, C20
L.W.	220 kc/s	L.W. 220 kc/s marker	C36, L9†

* *Adjust by sliding ring along ferrite rod.*
† *Adjust by sliding coil former along ferrite rod.*

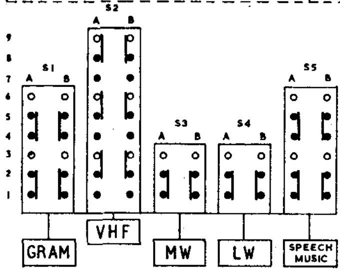
Alignment (F.M.I.F.): Use a signal generator providing Band II coverage, also 10·7 Mc/s A.M. (30 per cent modulated) and 10·7 Mc/s F.M. signals (25 Kc/s deviation) at an impedance of 75 Ω.

1. Switch to V.H.F., and allow the receiver and test equipment to warm up for about ten minutes; set volume control 90° back from maximum with treble and bass controls set to the midway position.

2. Inject 10·7 Mc/s F.M. signal between tag 7 and chassis, then adjust L31, L32, L27 and L23 for maximum output. Tune L31, L32 to outer peak, i.e. cores protruding from top of coil can.

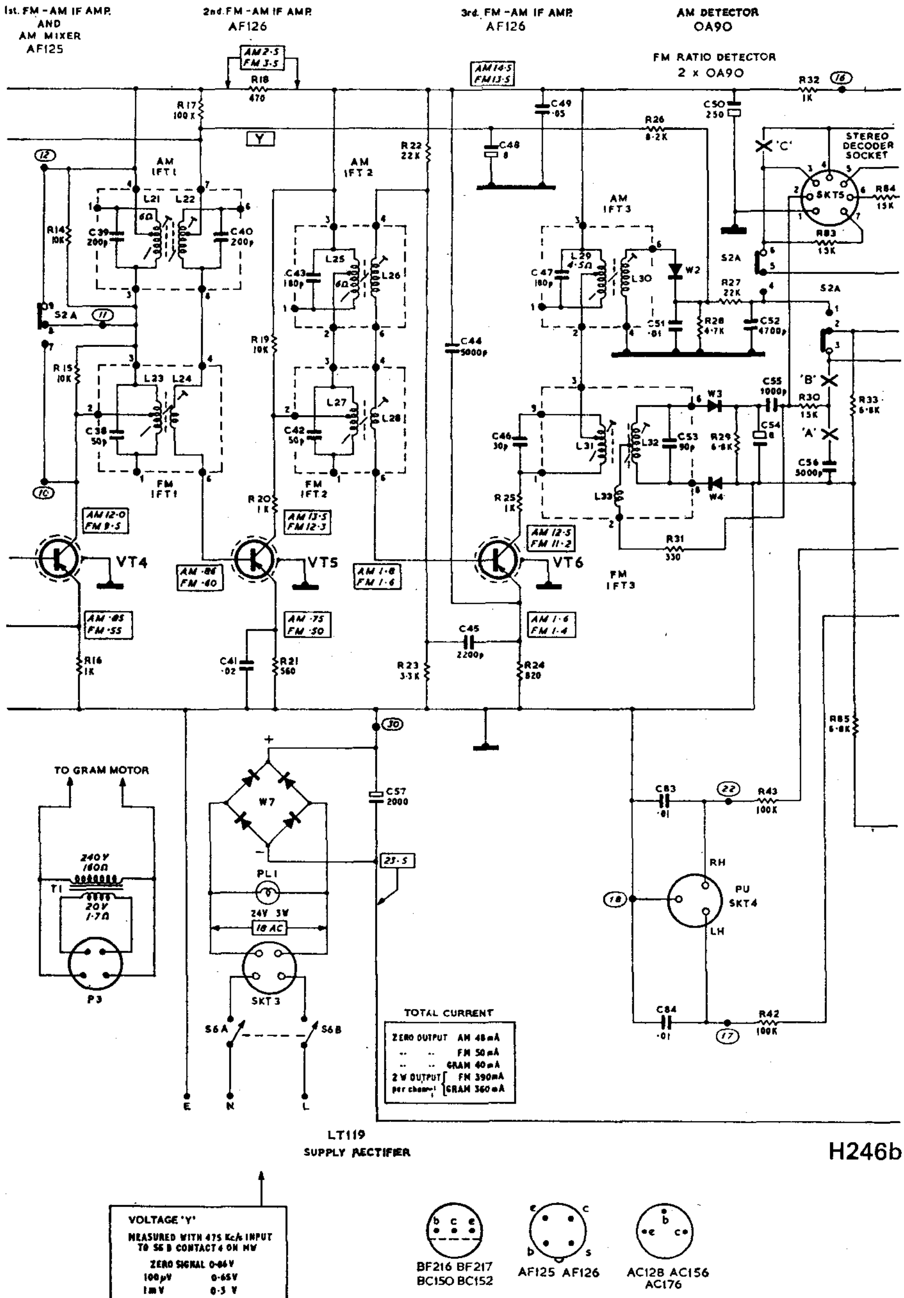


H246a

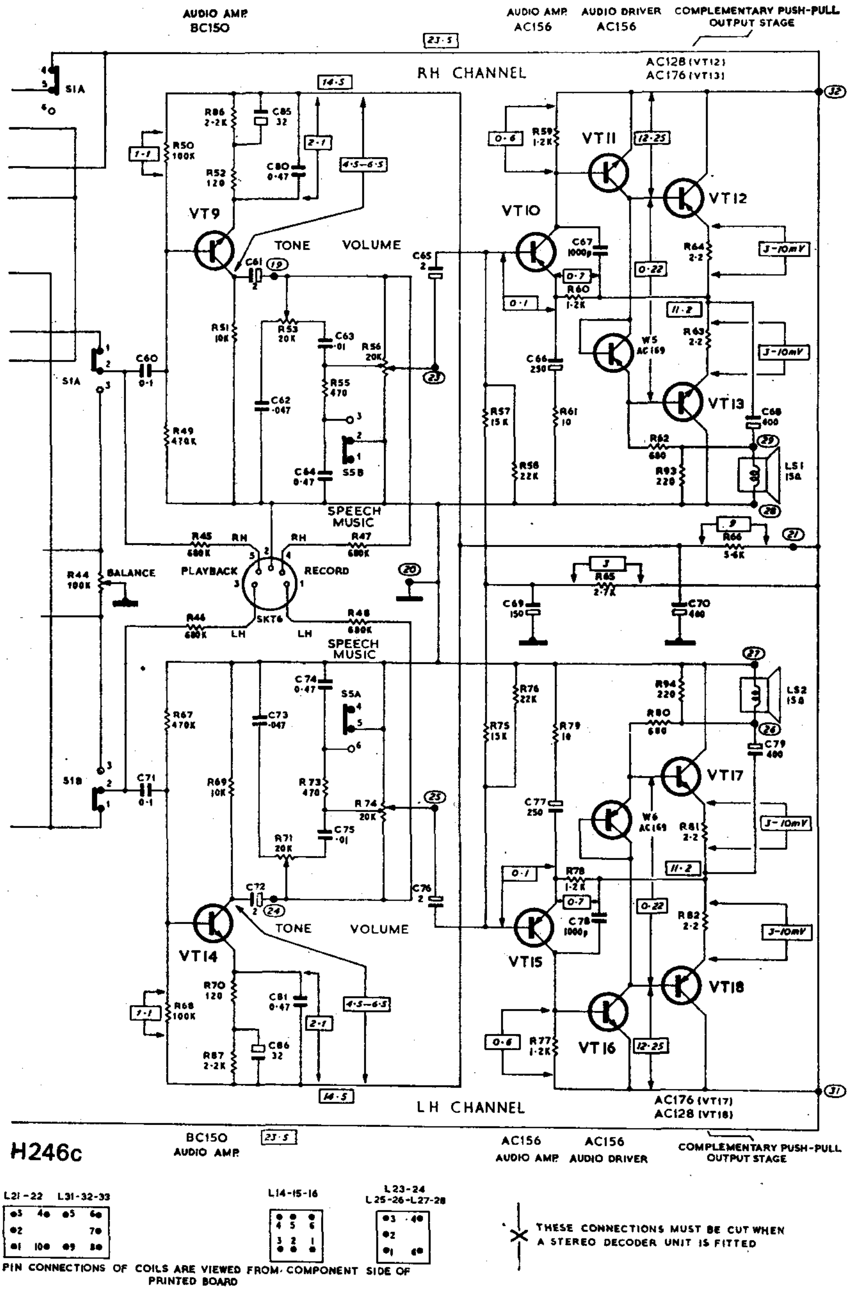


Circuit Diagram Notes: Voltage measurements shown in rectangles were taken relative to the positive rail of each transistor (except where otherwise indicated) with a 20,000 ohm/volt meter, and with a mains input of 245V. D.C. resistance readings are shown against inductors where these are 1 Ω or greater. When a stereo decoder unit Type SD2 is plugged into socket SKT5, the wire links A, B and C are cut where shown in the diagram.

(H246a) Circuit Diagram—Model 2332 (Part)



(H246b) Circuit Diagram—Model 2332 (Part)



(H246c) Circuit Diagram—Model 2332 (Continued)

3. A.M. rejection check: (*a*) Switch signal generator to 10·7 Mc/s A.M. and tune L32 for minimum output (this should be a sharply defined dip in output). (*b*) Switch signal generator to 10·7 Mc/s F.M. and check that F.M. output has been retained. If maximum A.M. rejection does not coincide with maximum F.M. output, L32 should be tuned for maximum rejection at the expense of a slight reduction in F.M. output.

Reset signal generator to 100 μV F.M. output and recheck operations 1, 2 and 3 using volume control to maintain the output level at 500 mW.

Alignment (F.M.R.F.): Check that the cursor coincides with the "zero" marker on the scale diffuser when the gang is fully closed. 1. Tune receiver to F.M. 94 Mc/s marker on scale diffuser. 2. Inject 94 Mc/s F.M. signal into F.M. aerial socket (SKT1) and adjust L5, L3 and L6 for maximum output. Repeat as necessary for correct calibration.

Caution

Heat sink grease is applied to output transistors during production and it must always be reapplied by the engineer when replacing a transistor in its heat sink during servicing.

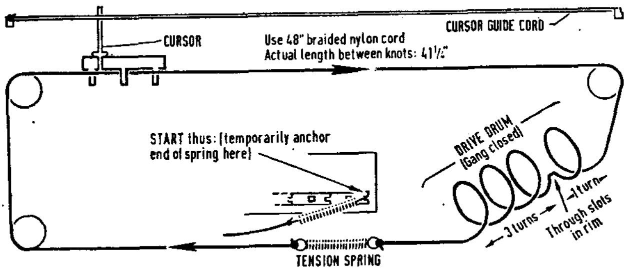
Heat sink compound DP2623, or anti-tracking grease MS4, is suitable and marketed by Midland Silicones Ltd.

H.M.V. Model 2340

General Description: Solid state stereo radiogram incorporating stereo decoder. Gramophone unit: Garrard 3000 L.M. with GKS25–T cartridge, and diamond L.P. stylus. Power output, 7 W per channel. Loudspeakers: two round (8 Ω) and two tweeters. Aerials: rotatable ferrite rod for M.W. and L.W., and internal dipole for V.H.F./F.M. Sockets: A.M. aerial, F.M. aerial and tape. Mains supply: 200–250 V, A.C., 50 Hz.

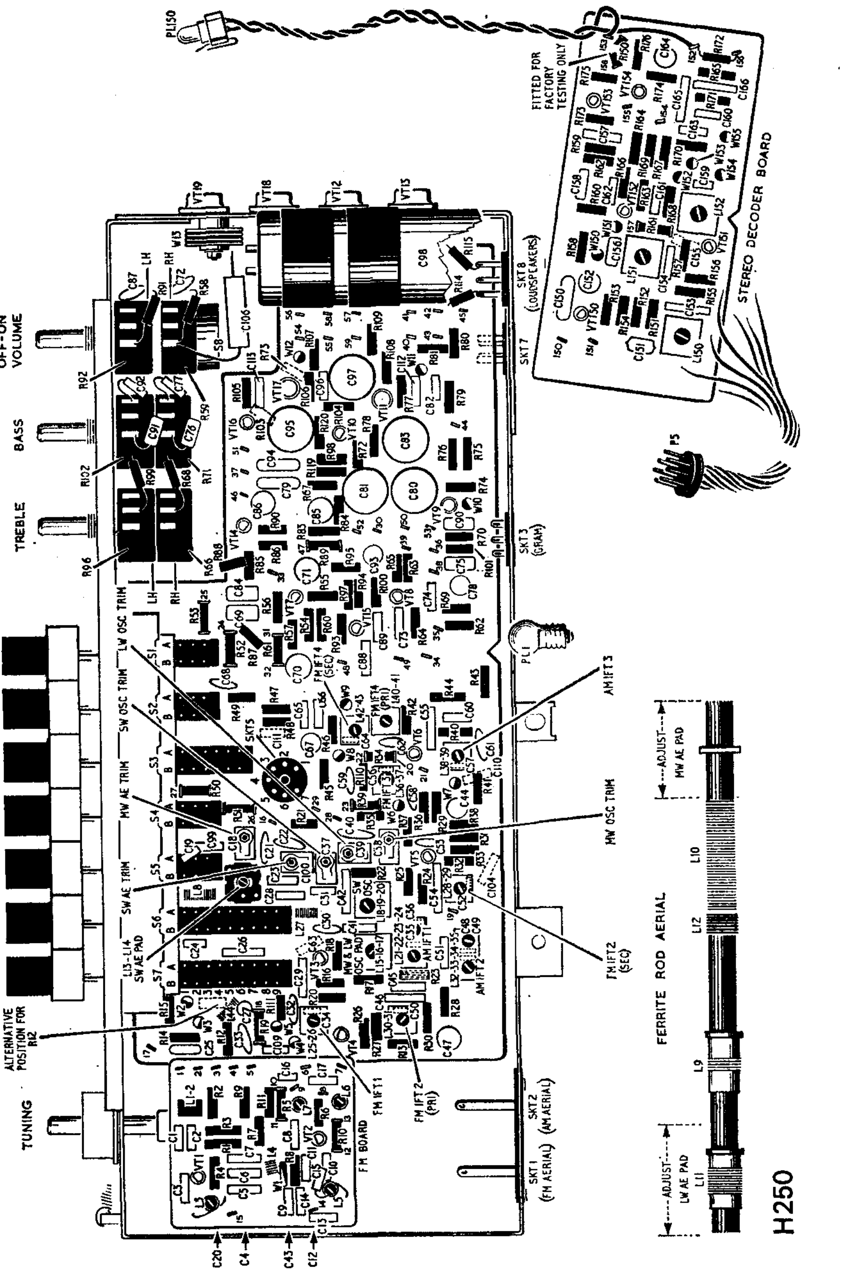
Wavebands: V.H.F./F.M.: 87·5–101 MHz. S.W.: 16·6–51 metres. M.W.: 185–566 metres. L.W.: 1120–2025 metres.

Access for Service: By removing three compartment covers at the rear, access is gained to the chassis, loudspeakers and underside of record changer.



H251

(H251) DRIVE CORD—MODEL 2340



(H250) Component Locations—Model 2340

(*a*) *Chassis Removal:* 1. With chassis compartment rear cover removed, unplug the internal F.M. aerial and detach tape/aerial panel from cabinet. 2. Detach pick-up mains transformer and loudspeaker plug connections from chassis and release mains lead cleat from cabinet. 3. Pull off the rotary control knobs. Remove 2BA nut and shakeproof washer located centrally at rear of chassis then withdraw chassis from front locating studs which are fixed inside top of cabinet.

(*b*) *Record Changer Removal:* Remove rear covers from chassis compartment and right-hand loudspeaker compartment. Unsolder motor leads from mains transformer and unplug pick-up lead from chassis. With record changer transit screws turned fully clockwise, pivot the clips on lower ends of transit screws to enable them to pass through motor board, then lift record changer out of cabinet.

(*c*) *Loudspeakers:* Out of phase loudspeakers give impaired quality of reproduction particularly on "stereo". If, therefore, a loudspeaker is disconnected it is essential to reconnect it in the same phase. The positive tag of each loudspeaker is marked with red paint. When reassembling do not omit to refit acoustic socks into loudspeaker compartments and check that sealing material is in position before refitting back covers.

Note: If the loudspeakers are to be operated with their cabinet back covers removed, it is essential to keep the volume level well attenuated otherwise damage to the high compliance speaker cones may result.

Audio Output: Connect an 8 Ω output meter in place of each loudspeaker or, alternatively, connect an oscilloscope across the loudspeaker (i.e. tags 44 and 45 for right-hand channel, or tags 59 and 45 for left-hand channel) and observe output waveform. Depress mono and gram keys simultaneously, turn volume, bass and treble controls to maximum (fully clockwise) and set balance control mid-way. Inject a 20 mV, 800 Hz signal from an audio oscillator between pin 1 of switch S4A and chassis (right-hand channel) and note output: this should be 5 W (clean and unclipped). Transfer input to pin 1 of switch S4B and chassis (left-hand channel) and check that output is again 5 W. Finally, check that outputs are within 2 dB of each other.

Tone Control: With test conditions as above, set mono push-button switch for "mono" operation, set tone controls mid-way and reduce 800 Hz signal to give an output of 500 mW, i.e. input should be in the region of 7 mV. To obtain a suitable reference point on the volume control, increase signal generator gain by 25 dB then reduce volume control setting to obtain original output level, i.e. 500 mW. Adjust balance control to give equal outputs from both channels. Inject an 80 Hz signal and turn bass control from minimum to maximum; this should produce a variation of approximately 17 dB. Inject an 8 kHz signal and turn treble control from minimum to maximum; this should produce a variation of approximately 20 dB. Finally, ensure that outputs from each channel for both bass and treble checks, are within 2 dB of each other.

Output Sockets: Switch to "tape" (gram and M.W. buttons depressed) and inject audio signal of 70 mV at 800 Hz into pins 2 and 5 (playback) of tape socket SKT6 with volume at maximum and tone controls mid-way; this should

produce an output of 5 W. Switch to "F.M." and inject an F.M. signal, 25 kHz deviation, into the F.M. aerial socket SKT1. With a signal level of 1 mV check that output from tape record socket (pins 2 and 4 of SKT6), is approximately 250 mV.

Alignment (General): Remove chassis as described in "Access for Service". Connect an output meter adjusted for 8 Ω impedance, or a 20,000 ohm/volt meter set to a suitable A.C. voltage range, across the left-hand or right-hand speaker sockets. Zero, trim and pad markers are provided on the scale diffuser.

Alignment (A.M.I.F.): Switch to M.W.: turn gang to maximum capacitance and volume control fully clockwise. Inject a 475 kHz signal, 30 per cent modulated, via a 0·1 μF capacitor between contact 5 of S6A and chassis (aerial section of tuning gang) then peak L38, L35/L34 and L24/L23 in that order, adjusting signal output level as required to maintain an output level of 500 mW. On completion of alignment, the generator output should be approximately 60 μV for 500 mW output.

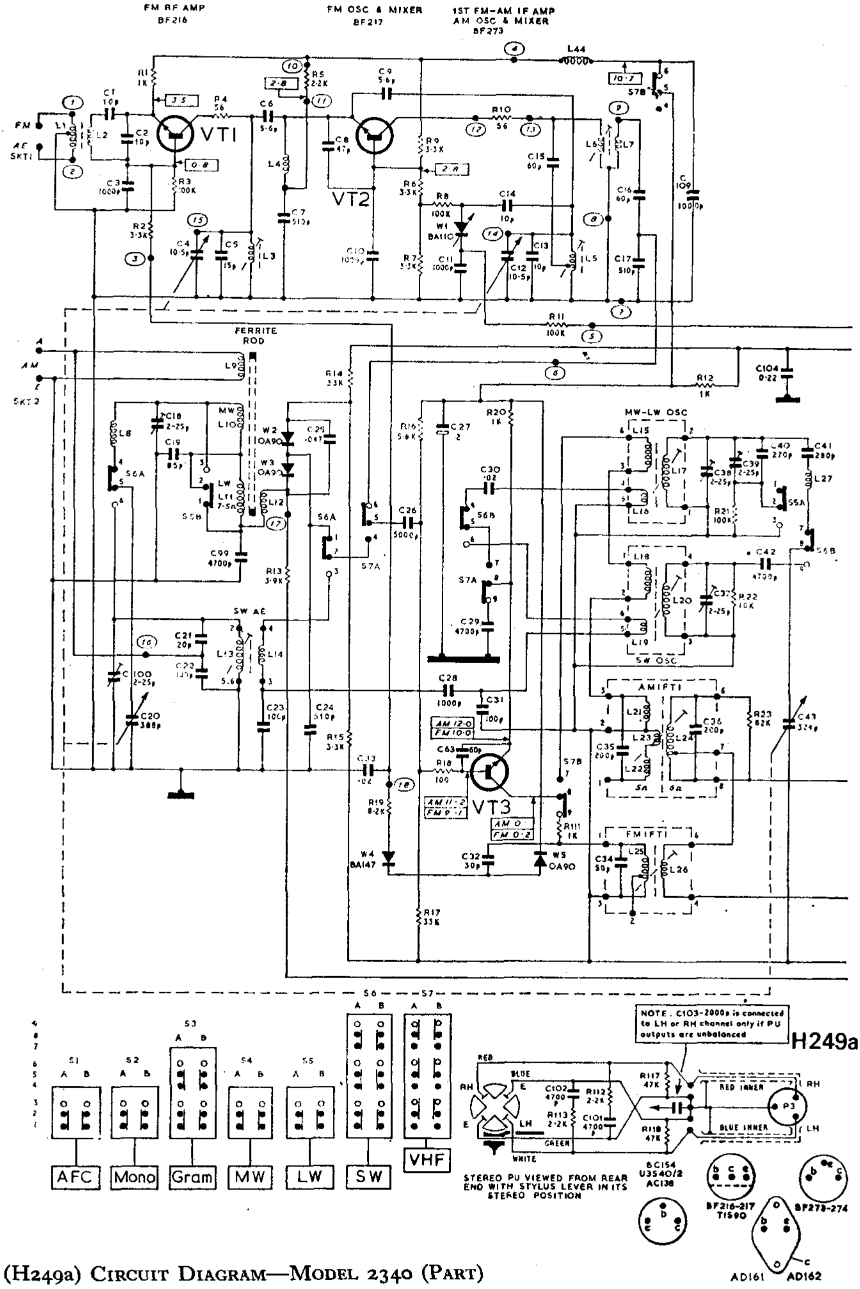
Alignment (A.M.R.F.): Medium wave should be aligned first. With tuning gang fully closed, align pointer to the zero datum mark on the scale diffuser. Inject R.F. signals, 30 per cent modulated, into the aerial and earth sockets (SKT2) via a 30 pF series capacitor. Alignment should be carried out in the following order, peaking for maximum output and reducing signal level as necessary, to maintain 500 mW output.

Range	*Inject*	*Cursor Position*	*Adjust*
M.W.	600 kHz 1400 kHz	M.W. Pad marker M.W. Trim marker	L17, L10 C38, C18
L.W.	220 kHz	L.W. 220 kHz marker	C39, L11
S.W.	6·77 MHz 15·8 MHz	M.W. Pad marker M.W. Trim marker	L20, L13 C37, C100

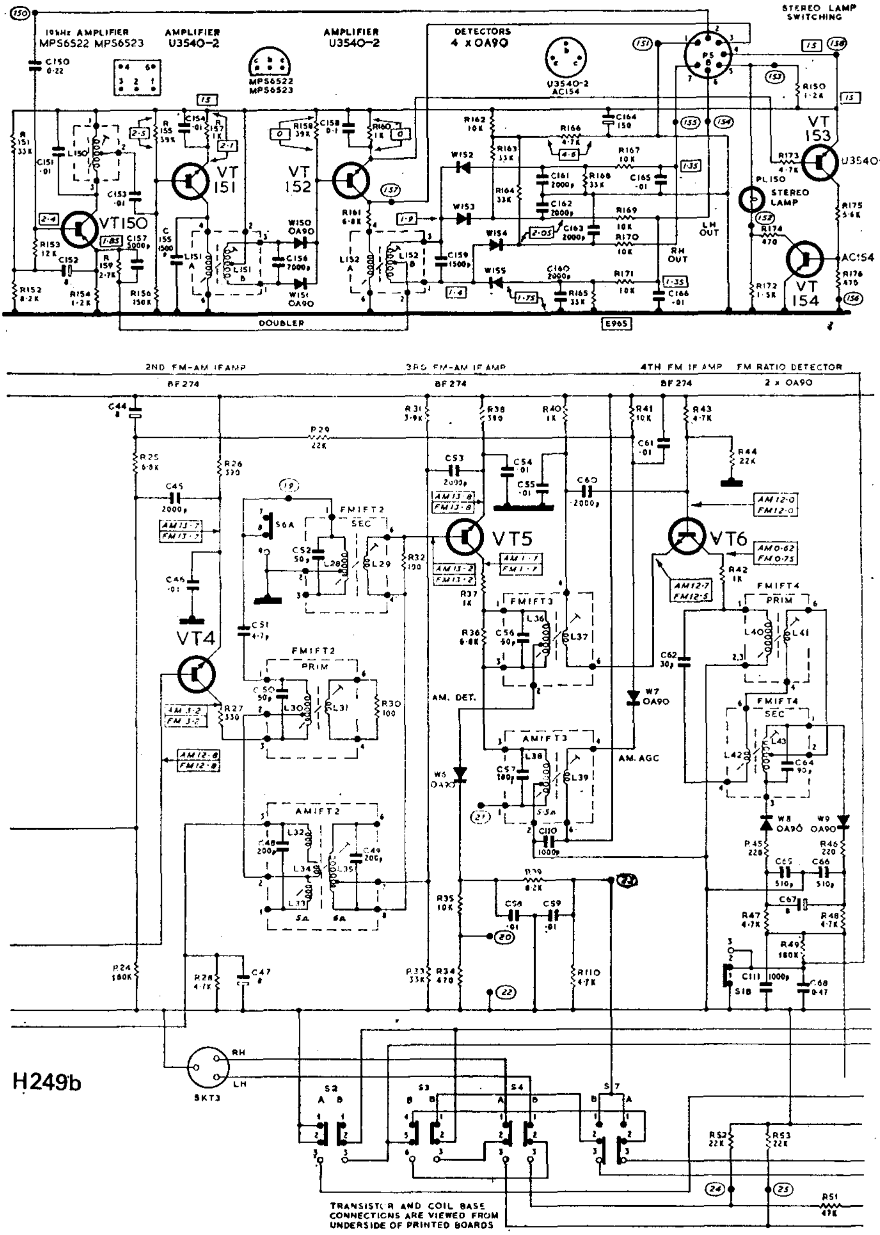
Adjust L10 by sliding ring along ferrite rod. Adjust L11 by sliding coil along ferrite rod.

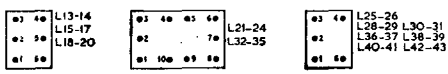
Alignment (V.H.F./F.M. Circuits): To obtain satisfactory operation of the A.F.C. it is essential that the discriminator circuit is adjusted to a balanced condition. This is achieved by measuring the voltage between the junction of R47/R48 and chassis. As the voltage swings alternately positive and negative a centre-zero meter (25–0–25 μA) with a series 33 kΩ resistor will provide a satisfactory means of measurement. An Avo Model 8 on the 50 μA D.C. range may be used but is not so satisfactory for following the positive and negative voltage swings, or for reading zero.

Alignment (V.H.F./F.M. I.F.): Select V.H.F./F.M. and switch A.F.C. off. Inject a 10·7 MHz signal, 25 kHz deviation, between test point of F.M. tuner (tag 11) and chassis. Adjust cores of L43 and L40 (discriminator) for maximum output then check that centre-zero meter reads zero. If otherwise, readjust L43 for zero and repeak L40. Peak L36 (F.M.–I.F. T3), L28 and L30 (F.M.–I.F.

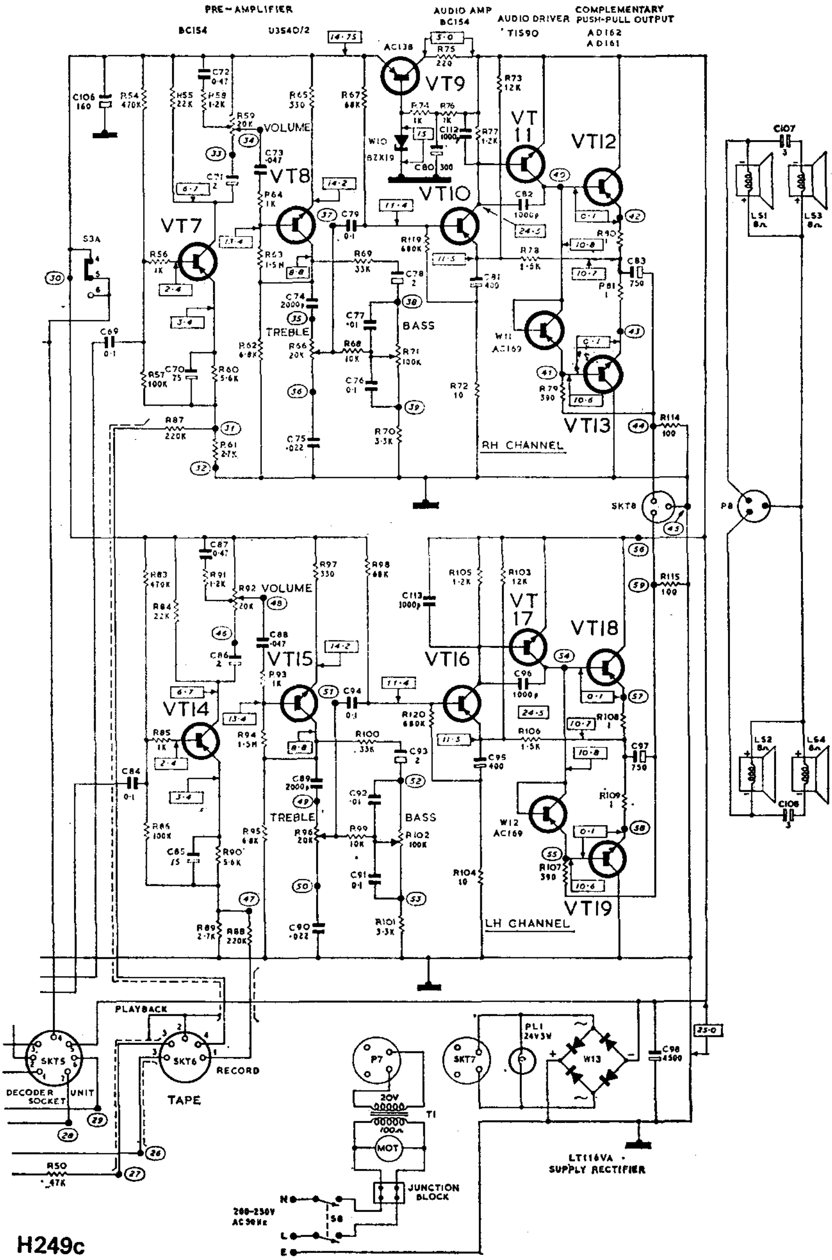


(H249a) Circuit Diagram—Model 2340 (Part)





(H249b) Circuit Diagram—Model 2340 (Part)



H249c

(H249c) Circuit Diagram—Model 2340 (Continued)

T2), L25 (F.M.–I.F. T1) and L6 (tuner I.F.) in that order for maximum output. If necessary, readjust L43 for zero reading and repeat above adjustments. Complete the I.F. alignment using an input signal of 100μV and with the volume control reduced to give an output of 500 mW. Maximum output should coincide with zero reading on centre-zero meter. A check of balance can be made by swinging signal generator either side of 10·7 MHz when centre-zero meter should show a similar deflection to positive and negative.

Alignment (V.H.F./F.M. R.F.): Leave centre-zero meter connected as for I.F. alignment. Tune receiver to 94 MHz marker and inject 94 MHz, 25 kHz deviation, to F.M. aerial socket (SKT1). Adjust L5 and L3 for maximum output. A slight pulling of the oscillator may be indicated by the centre-zero meter moving off zero; this can be corrected by slightly retuning L5 and then peaking L3 for maximum.

Alignment (F.M. Multiplex Decoder): Although alignment of the decoder panel is quite straightforward, no attempt should be made at realignment unless suitable equipment is available. This should consist of an encoder providing a 19 kHz pilot signal and also a composite signal that may be switched to provide a difference signal, a mono signal, and an easily identified combined left- and right-hand signal (or possibly separate left-hand and right-hand signals).

Inject a 19 kHz pilot signal to pin 2 of SKT5 (decoder socket) and connect a millivoltmeter, capable of reading up to 250 mV at 19 kHz, between pin 4 of L152 and chassis.

Peak L150, L151 and L152 for maximum output (reducing 19 kHz signal level during alignment to maintain an output of 200 mV). L152 should be peaked with the core almost fully unscrewed but if no peak is observed the core should be left fully unscrewed. For an output of 200 mV the 19 kHz input should be approximately 7 to 10 mV.

Inject a composite signal to pin 2 of SKT5, and select the difference signal. With an input of 200–250 mV, check that the output from each channel is equal; if otherwise, slightly readjust L151 for maximum equal outputs. With the voltmeter connected to pin 6, then to pin 7 of SKT5 the output from each should be 200 mV. If the output is checked at the loudspeaker sockets it is essential that the audio amplifiers are correctly balanced before commencing alignment.

If left-hand and right-hand signals are available, check that decoder outputs are correctly phased, i.e. right-hand input gives an output from right-hand channel; and that separation is satisfactory, i.e. right-hand input gives minimum left-hand output.

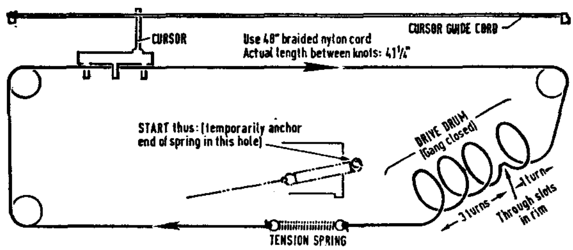
The stereo indicator lamp should light with a composite signal input of 100–125 mV.

Circuit Diagram Notes: Figures in rectangles are voltages measured with a 20,000 ohm/volt meter with respect to positive chassis unless otherwise indicated. D.C. resistance readings are shown against inductors where these are 1 Ω or greater Ringed figures indicate printed board tag connection points.

H.M.V. Model 2342

General Description: Stereo radiogram with a power output of 2 W (continuous tone) per channel. Record changer: BSR UA15 with SXIM cartridge and ST8 stylus. Aerials: rotatable ferrite rod for M.W. and L.W., internal dipole for V.H.F./F.M. Loudspeakers: two, elliptical, 15 Ω. Sockets: A.M. aerial, F.M. dipole and tape. Mains supply: 200–250 V, A.C., 50 Hz.

Wavebands: M.W.: 185–566 metres. L.W.: 1120–2025 metres. V.H.F./F.M. 87·5–101 MHz.



H254

(H254) Drive Cord—Model 2342

Dismantling (Record Changer): Take out screws and unplug F.M. aerial lead to release back cover. Unplug pick-up connector from radio chassis and unsolder gram motor lead from mains transformer. With record changer transit screws turned fully clockwise, pivot clips on lower end of transit screws to enable them to pass through motor board then lift record changer clear of cabinet.

Dismantling (Chassis Removal): Pull off rotary control knobs. This is best done by using a length of stout cord as a "puller". Remove centre back cover. Release mains lead clamp then detach connectors from chassis (mains transformer, pick-up and loudspeakers).

Note: When removing loudspeaker socket connector from printed board, ease gently forwards to avoid breaking soldered connections on copper side of board.

Remove 2BA nut on screw passing through chassis fixing lug located centrally at rear of chassis. The chassis may now be pulled clear of front locating studs and manœuvred out through rear of cabinet.

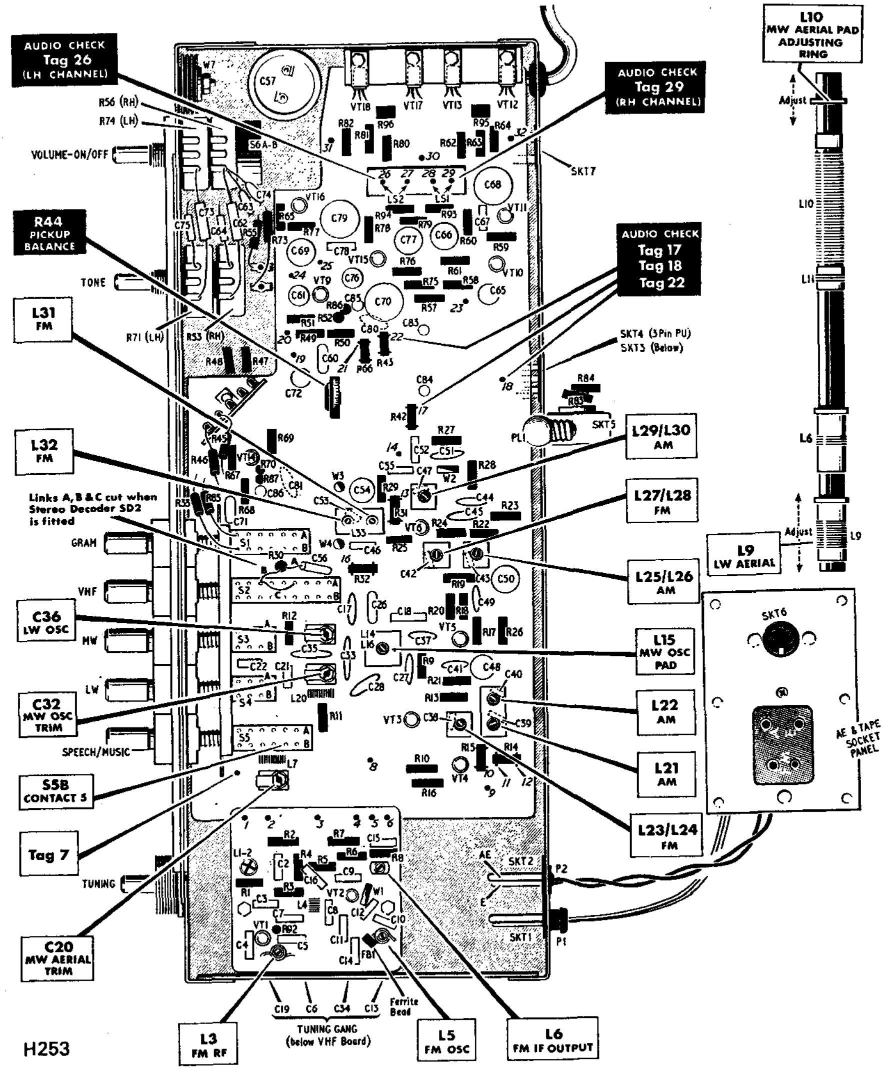
Warning: When withdrawing or refitting the chassis, take care to avoid scraping the scale backing paint with the control spindles.

Pick-up Balance: R44 is a pre-set control which balances the left-hand and right-hand outputs from the pick-up and normally will require adjustment only if the pick-up cartridge is replaced.

Audio Check: Connect a 15 Ω impedance output meter in place of each loudspeaker. Alternatively, examine output waveform on an oscilloscope connected between tag 29 (or tag 26 for left-hand channel) and chassis. Switch to gram and turn tone control fully clockwise. Release speech/music button,

then connect audio oscillator between tags 22 and 18. Inject a 15–20 mV, 800 Hz signal and note output: for a correctly functioning amplifier this should be clean, unclipped and approximately 2 W. Transfer input to tags 17 and 18 and similarly check other amplifier.

Tone Control Check: With test conditions as for the amplifier audio check, volume control at maximum, tone control set to the midway position, and the speech/music button released, reduce input of 800 Hz signal to produce 200 mW



(H253) Component Locations—Model 2342

output: this will require an input of approximately 5 mV. Back off volume control 20 dB, i.e. increase input 20 dB and adjust volume control to reduce output to original level. Inject an 80 Hz audio signal: output should increase by 10 dB. Depress speech/music button and check that output reduces to approximately original level. Inject an 8 kHz audio signal and turn tone control from minimum to maximum: this should produce a variation of 18 dB in output level.

Alignment (General): Connect an output meter adjusted for 15 Ω impedance in place of left-hand or right-hand loudspeaker, or a 20,000 ohm/volt meter set to a suitable A.C. voltage range across the left-hand or right-hand loudspeaker sockets. Zero, trim and pad markers are provided on the scale diffuser.

Alignment (A.M.I.F.): Select M.W.: turn gang to maximum capacitance position and volume control fully clockwise. Inject a 475 kHz, 30 per cent modulated, signal via a 0·1 μF capacitor between contact 5 of switch S5B and chassis, then peak L29/L30, L25/L26, L22 and L21 for maximum output, adjusting signal input level as required to maintain an output level of 200 mW.

Alignment (A.M.F.R.): With the tuning gang at maximum, check that the cursor coincides with the zero marker on the scale diffuser. Align M.W. first. 30 per cent modulated signal should be injected at A.M. aerial/earth socket via a 30 pF series capacitor.

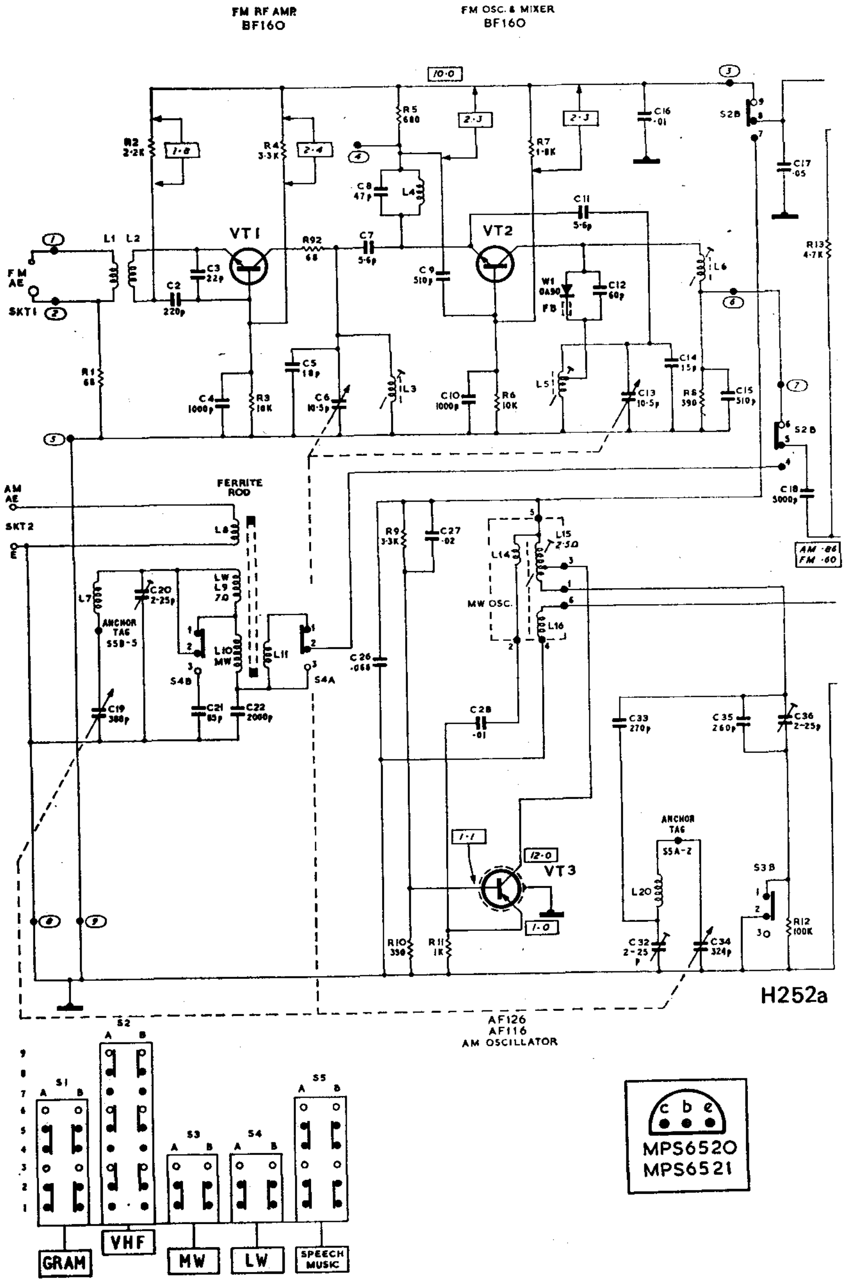
Range	*Cursor Position*	*Inject*	*Adjust*
M.W.	M.W. pad marker M.W. trim marker	600 kHz 1400 kHz	L15, L10 C32, C20
L.W.	L.W. 220 kHz marker	220 kHz	C36, L9

Adjust L10 by sliding ring along ferrite rod and L9 by sliding coil former along ferrite rod.

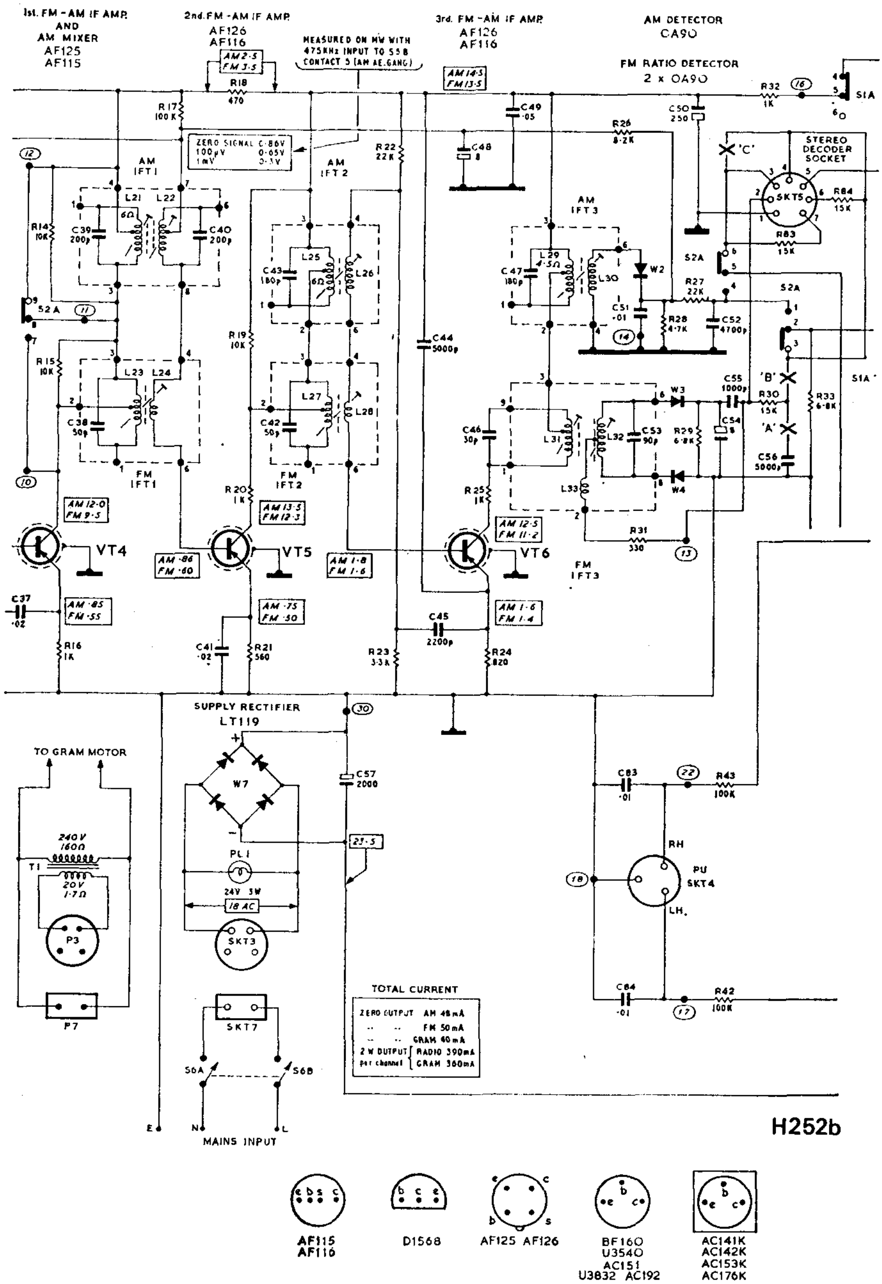
Alignment (F.M.I.F.): Use a signal generator providing Band II coverage, also 10·7 MHz A.M. (30 per cent modulated) and 10·7 MHz F.M. signals (25 kHz deviation) at an impedance of 75 Ω. Select V.H.F., and allow the receiver and test equipment to warm up for about 10 minutes; set volume control 90° back from maximum with treble and bass controls set to the midway position. Inject 10·7 MHz F.M. signal between tag 7 and chassis, then adjust L31, L32, L27/L28 and L23/L24 for maximum output. Tune L31 and L32 to outer peak, i.e. cores protuding from top of coil can.

Alignment (A.M. Rejection Check): Switch signal generator to 10·7 MHz A.M. and tune L32 for minimum output (this should be a sharply defined dip in output). Switch signal generator to 10·7 MHz F.M. and check that F.M. output has been retained. If maximum A.M. rejection does not coincide with maximum F.M. output, L32 should be tuned for maximum rejection at the expense of a slight reduction in F.M. output.

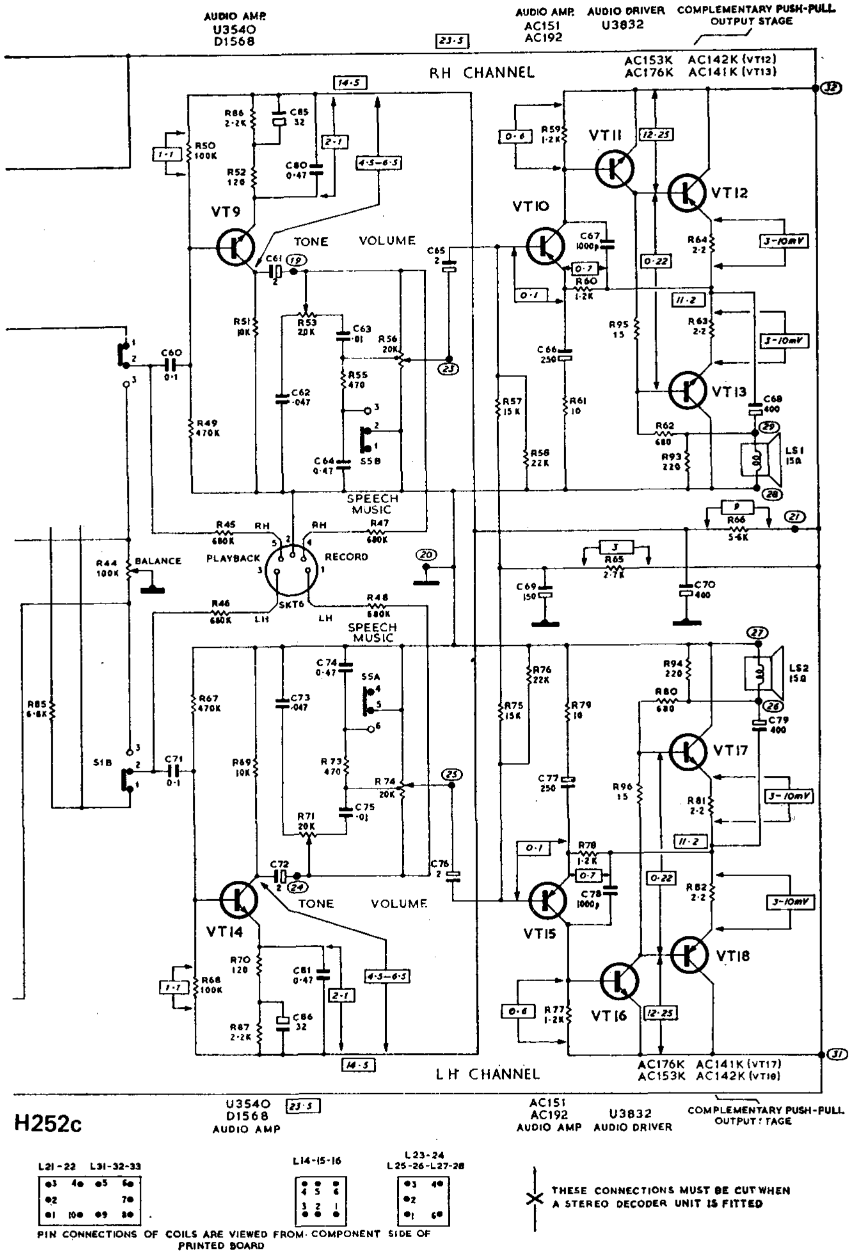
Reset signal generator to 100 μV F.M. output and recheck operations in F.M.I.F., (above) using volume control to maintain the output level at 500 mW.



(H252a) Circuit Diagram—Model 2342 (Part)



(H252b) CIRCUIT DIAGRAM—MODEL 2342 (PART)



(H252c) Circuit Diagram—Model 2342 (Continued)

Alignment (F.M.R.F.): Check that the cursor coincides with the "zero" marker on the scale diffuser when the gang is fully closed. Tune receiver to F.M. 94 MHz marker on scale diffuser. Inject 94 MHz F.M. signal into F.M. aerial socket and adjust L5, L3 and L6 for maximum ouput. Repeat as necessary for correct cabibration.

Circuit Diagram Notes: Voltage measurements shown in rectangles were taken relative to the positive rail of each transistor (except where otherwise indicated) with a 20,000 ohm/volt meter, and with a mains input of 245 V. D.C. resistance readings are shown against inductors where these are 1 Ω or greater.

Modifications: In earlier production chassis, P7 and SKT7 were not fitted and the mains connections to transformer T1 primary were made via the unused connectors of P3 and SKT3. SKT3 was then located on the chassis where SKT7 is shown in the Components Location diagram. In later production receivers, P3 and SKT3 are changed to a two-pin plug and socket. In some receivers, VT14 may be transistor type MPS6520 or MPS6521 instead of one of the specified types shown in the circuit diagram.

H.M.V. STEREOMASTER Model 2400

General Description: Gramophone with solid state circuit featuring 17 transistors and 1 Zener diode in a mains powered "cool" chassis incorporating a Selenium bridge power rectifier. Mains supply: 200–250 V, A.C., 50 Hz. Power consumption: 30 W. Power output: 14 W. Turntable unit: Garrard 3000. Pick-up cartridge: Acos GP94/1 with diamond L.P. stylus. Loudspeakers: two round (8 Ω) and two tweeters.

Sockets: Stereo or mono tape recorder record and play-back socket. (*a*) *Record:* 150 mV out (impedance 75 K) with 150 mV radio input. (*b*) *Playback:* 300 mV in (impedance 57 K) for 5 W output. (*c*) *Radio:* 50 mV in (impedance 68 K) for 5 W output.

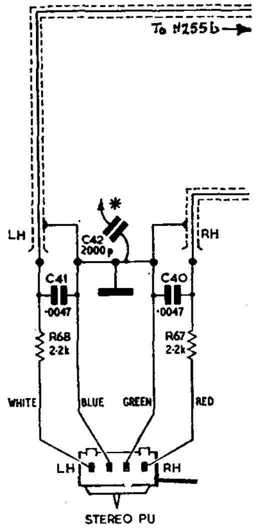
Controls: Mains on/off: treble: +11 dB to −12 dB at 10 kHz; Bass: +15 dB to −12 dB at 50 Hz; +15 dB to −14 dB at 30 Hz; Volume (loudness type): Additional bass boost of 7 dB at 40 Hz when set to 25 dB attenuation; Stereo/mono selector; Selector switch for gram, tape and radio.

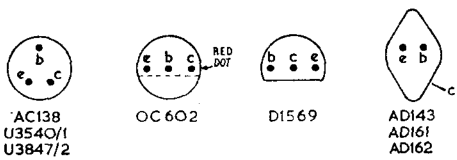
Chassis Removal: Unscrew transit screws fully anticlockwise to lock autochanger then secure pick-up. Detach ventilation panel (3 screws) from turntable compartment. Take out two chromed screws (one at each end of control panel). Carefully ease the control panel upwards, within the limits of the connecting leads, to expose the complete component assembly. For complete separation from cabinet, turn cabinet on to its side on a protective surface. Remove centre base panel and unsolder pick-up leads from components mounted on tag panel fitted to the underside of the auto-mechanism baseplate, disconnect loudspeaker leads (noting colour coding for reassembly) and unsolder motor leads from mains transformer, then release mains lead from cabinet. The complete chassis may now be removed from the cabinet.

(H255a) Circuit Diagram—H.M.V. Model 2400 (Part)

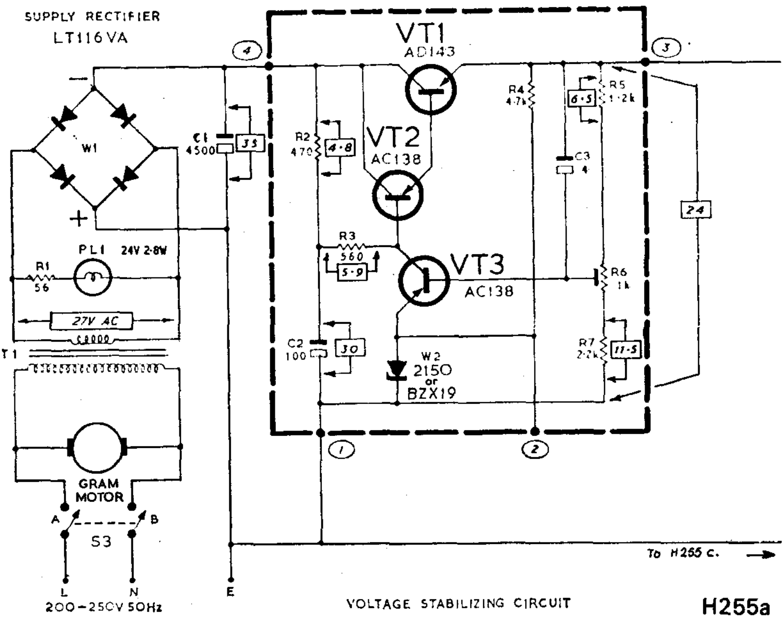
Circuit Diagram Notes: 1. Voltage readings shown in rectangles were taken relative to positive chassis line (except where otherwise indicated) under quiescent conditions, with a 20,000 ohms per volt meter set to the appropriate range, and with a mains input of 245V. 2. Ringed figures indicate printed board tag connection points.

Circuit Diagram Errata: The numbers on the tape socket (SKT1) are shown incorrectly: 1 and 3, and, 4 and 5, should be transposed.

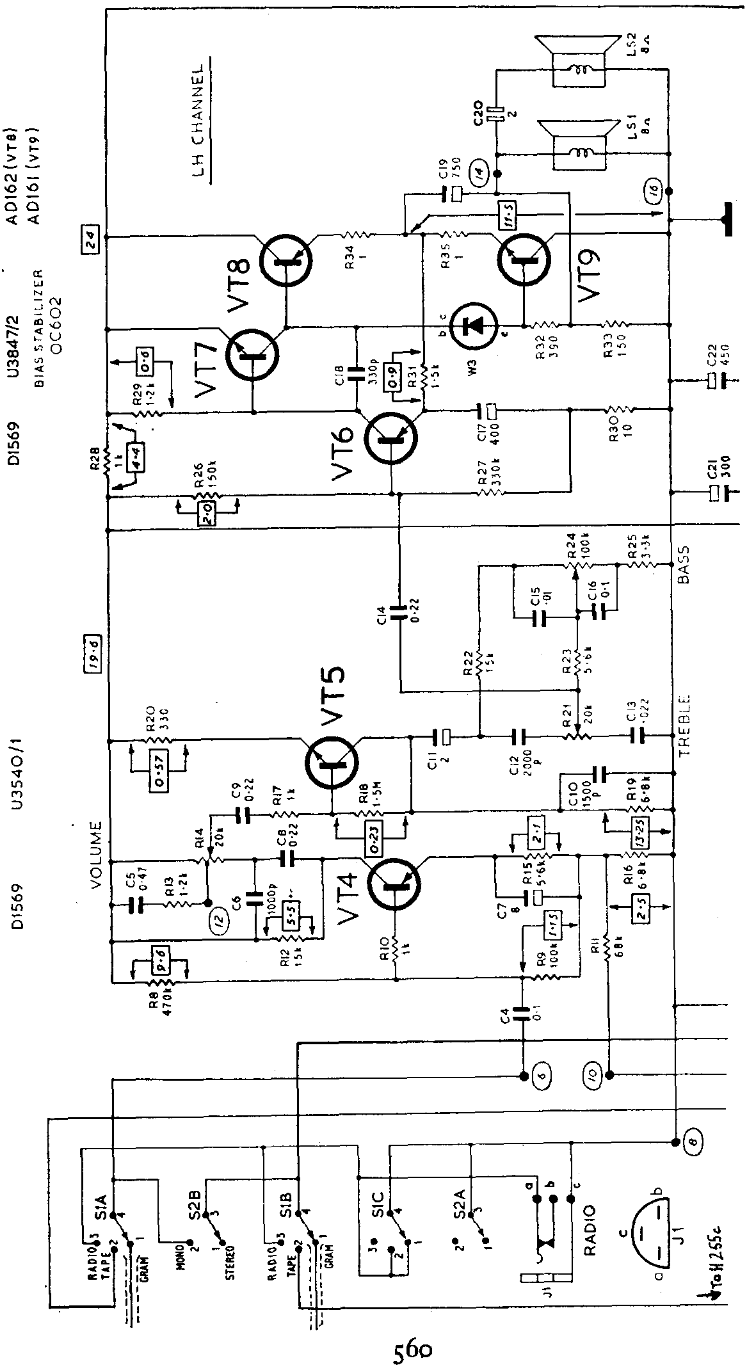




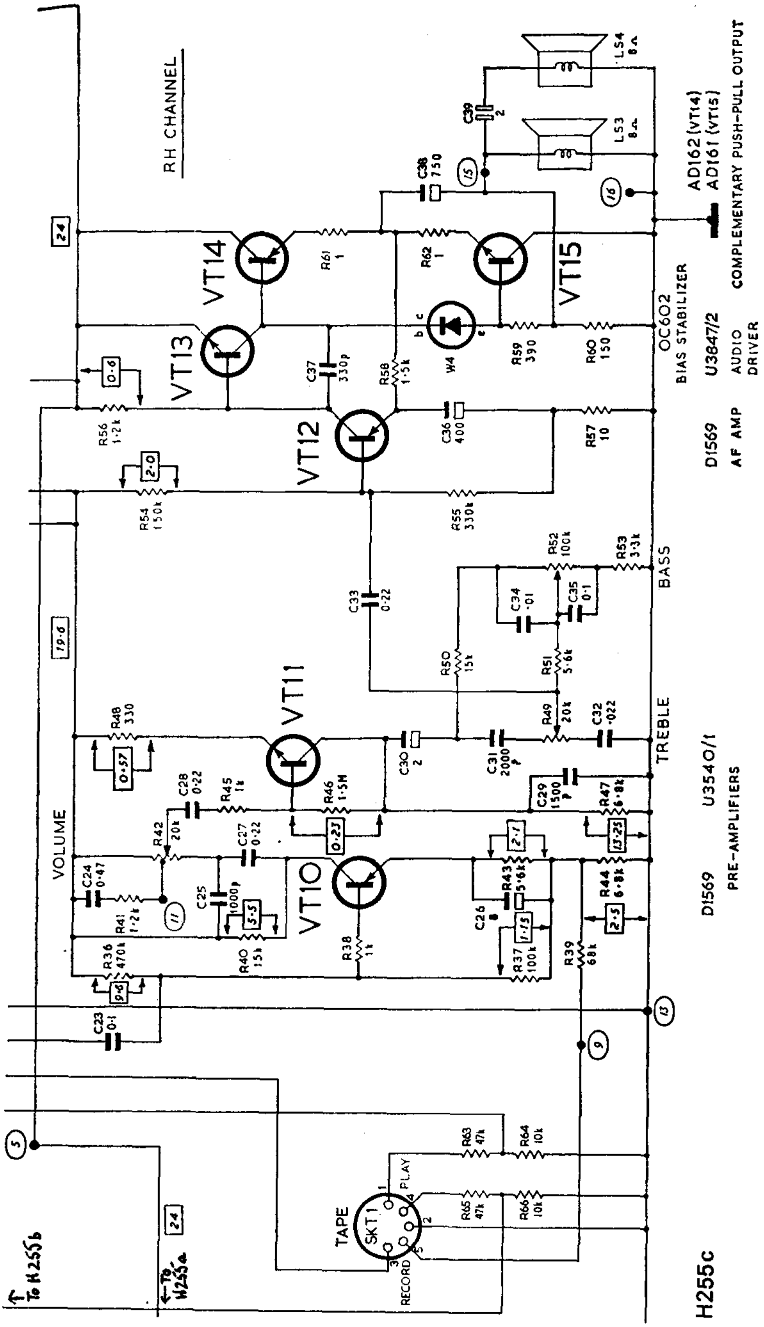
* C42 (PICKUP BALANCE) MAY BE FITTED TO LH OR RH CHANNEL, OR MAY BE OMITTED, DEPENDING UPON CHARACTERISTICS OF PICKUP CARTRIDGE.



VOLTAGE STABILIZING CIRCUIT H255a



(H255b) Circuit Diagram—H.M.V. Model 2400 (Part)



(H255c) Circuit Diagram—H.M.V. Model 2400 (Continued)

Note: If during servicing, it is required to operate the model with the cabinet base covers removed, then the volume level must be kept well attenuated to avoid damage to the high compliance loudspeaker cones.

Record Changer Removal: Detach ventilation panel from turntable compartment, take off cabinet base cover, disconnect motor leads from mains transformer and, taking note of connections, unsolder pick-up cableform from resistors and capacitors connected to tag strip mounted on auto-mechanism baseplate. With transit screws turned fully clockwise, pivot clips on transit screws to enable them to pass through motor board, then lift changer out of cabinet.

Pick-up Cartridge Replacement: Ease forward the small spring clip at the front end of the pick-up head to release the pick-up cartridge then detach plugs from pins at rear of cartridge, noting colour coding to ensure correct connections to the replacement. See also circuit diagram for note concerning pick-up balance.

Stylus Replacement: To remove the assembly, select the L.P. stylus and prise out the complete assembly by inserting a finger nail under the tongued projection at the top of the plastic mounting. Position replacement stylus assembly with the tongue on top and press to engage in selector lever assembly. After replacement, ensure that the stylus arm is engaged properly within the V-shaped fork of the cartridge.

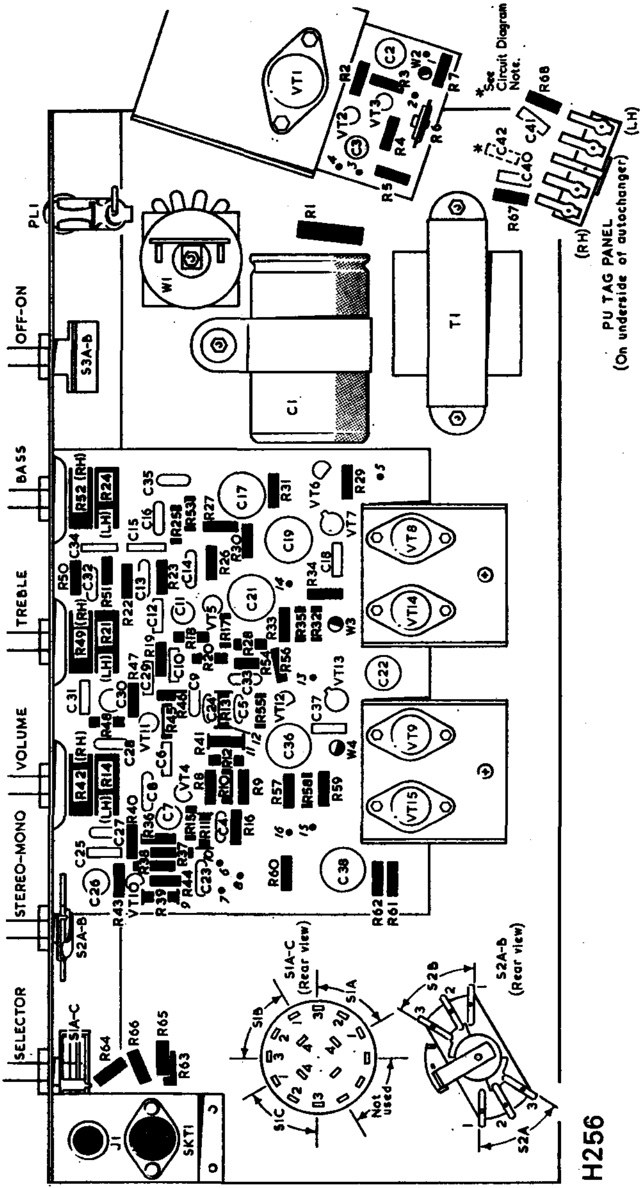
Stylus Pressure: To adjust stylus pressure (pick-up weight) turn the knurled nut on the underside of the pick-up arm clockwise to decrease or counter-clockwise to increase pressure.

Heat Sink Components: When replacing an output transistor, ensure that the insulating bushes and mica insulator are correctly located. No airspace should exist between the transistor, mica insulator or the surface of the heat sink. To obtain this condition when replacing transistors, an application of suitable heat-conducting grease is required to both sides of the mica insulator. Heat sink compound DP2633, or anti-tracking grease MS4, is suitable.

Loudspeaker Phasing: When disconnecting or replacing loudspeakers note the respective connections to the positive and negative tags of each loudspeaker to ensure the same polarity when reconnecting.

Audio Check (Output): Before carrying out any tests, check that D.C. supply voltage is 24V and if necessary, correct by adjusting the pre-set potentiometer R6. Connect an 8 Ω output meter in place of each loudspeaker or, alternatively, connect an oscilloscope across the loudspeaker and observe the output waveform. Switch to "Mono" and "Gram" and turn volume, bass and treble controls to maximum (fully clockwise). Inject a 50mV, 800Hz signal from an audio oscillator into each PU lead in turn and note output which should be 5W, clean and unclipped. Check that output of one channel is within 2dB of the other.

Audio Check (Tone Controls): With test conditions as above, set tone controls to mid position and reduce 800Hz signal to give an output level of 500mW; the input required should be of the order of 10–15mV. Back off volume control by 25dB (i.e. increase signal by 25dB then reduce volume



(H256) Component Locations—Model 2400

control to give original output level). Inject 80 Hz signal and turn bass control from minimum to maximum; the output should vary by 24 dB. Inject 8000 Hz and turn treble control from minimum to maximum; the output should vary by 20 dB.

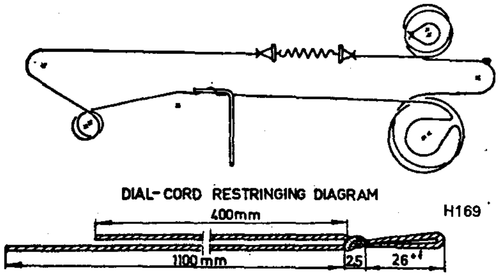
Note: The output from one channel should be within 2 dB of the other during above checks.

Audio Check (Sockets): It should be noted that unless a fault condition exists in the audio amplifier, operation of the volume, bass and treble controls should have no effect on the output voltage to the tape recorder. Switch to "Tape" and inject 800 Hz audio signal to tape socket SKT1 with volume at maximum and tone controls set to mid position: an input of 300 mV should give 5 W output per channel. Switch to "Radio" and inject audio signal to radio jack (J1). With volume and tone controls as above an input of 25–30 mV should give 5 W output. Output at "Tape" socket for recording purposes should be 25 mV.

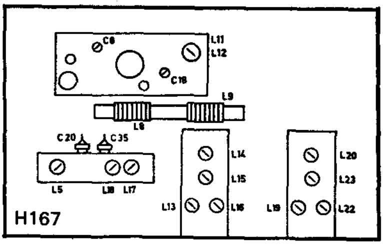
JUGO-ELEKTRO Melody and Retra 333

General Description: Five-valve A.C. mains receiver with diode bridge rectifier. The "Melody" has two 8 Ω speakers in parallel, while the "Retra" has one 4 Ω speaker.

Alignment: See alignment diagram table following.



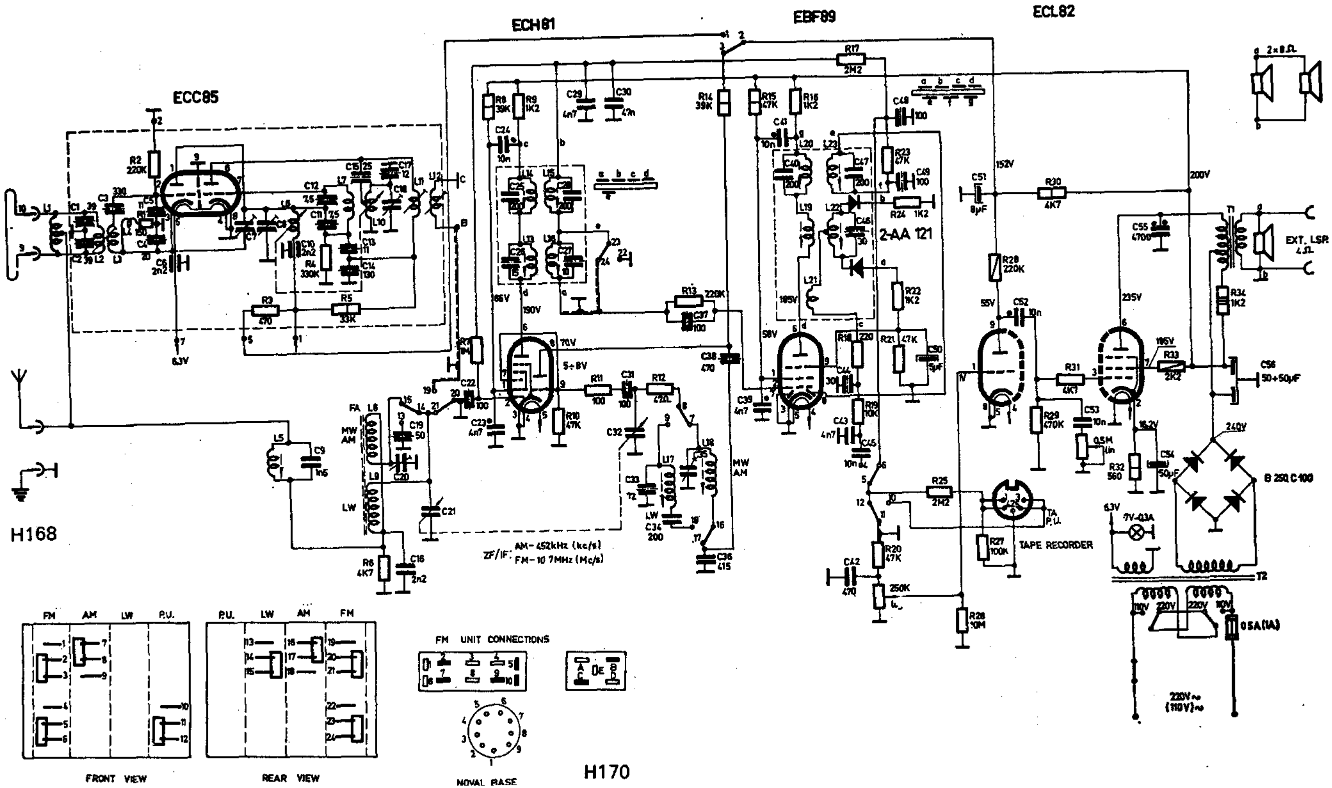
(H169) Drive Cord—Melody and Retra 333



(H167) Alignment Diagram

Alignment	*Wave-range*	*Pointer*	*Signal generator*	*Connecting*	*Trimming points*	*Output*
A.M.–I.F.	M.W.	1550kc/s	452kc/s 30% A.M.	g1–ECH81	L23, 20, 15, 14	Maximum
I.F. reject filter	M.W.	1550kc/s	452kc/s 30% A.M.	A.M. aerial socket	L5	Minimum
L.W.-osc.	L.W.	185kc/s	185kc/s	,,	L17	Maximum
L.W.-ant.	L.W.	185kc/s	185kc/s	,,	L9	Maximum
M.W.-osc.	M.W.	600kc/s	600kc/s	,,	L18	Maximum
		1420kc/s	1420kc/s	,,	C35	
M.W.-ant.	M.W.	600kc/s	600kc/s	,,	L8	Maximum
		1420kc/s	1420kc/s	,,	C20	Maximum
F.M.–I.F.	V.H.F.	94Mc/s	10·7Mc/s A.M.	g1–ECH81	L22	Minimum
F.M.–I.F.	V.H.F.	94Mc/s	10·7Mc/s	,,	L19, 16, 13	Maximum
F.M.–I.F.	V.H.F.	94Mc/s	dev. 50kc/s mod. 1kc/s	V.H.F. aerial socket	L12, 11	Maximum
F.M.-osc.	V.H.F.	90Mc/s	90Mc/s F.M. mod. 1kc/s	,,	C18	Maximum
F.M.-ant.	V.H.F.	90MC/s	90Mc/s F.M. mod. 1kc/s	,,	C8	Maximum

Circuit Diagram Notes: All the voltages measured with instrument 20kΩ F.M. switched.



(H168) Circuit Diagram—Melody and Retra 333—A.M. Switched
The two speakers in parallel are shown top right. Component details are inset bottom left.

K.B. Model KP037

General Description: Stereo record player with 6 transistors in each channel. Power supply: 240 V 50 Hz. Power consumption: 26 W (40 VA). Power output: 7 W for 10 per cent distortion.

Circuit Description: Inputs from the pick-up cartridge and sockets are selected by a 4-pole 3-way switch. The selected signal is then fed to the GMA20 amplifier boards where in each channel it is applied to the base of TXa1. This transistor is provided with capacitive feedback by Ra2 and Ca1 and, therefore capacitively loads the input.

The signal is fed via Ca2 to the stereo tone control module GMC22. This module employs frequency selective negative feedback to give approximately 10 dB of lift and 18 dB of cut at 10 kHz and 13 dB of lift and 19 dB of cut at 60 Hz.

From the balance control the signal passes to TXa2, the pre-driver, and on to TXa3, the driver. This transistor has D.C. feedback applied to it via Ra15. The output transistors TXa4 and TXa5 function in the common emitter mode due to the A.C. referencing action of Ca8. The signal voltage is developed across Ra12 and applied between the base and emitter of each output transistor.

The biasing of both the driver and output stages can be adjusted by Ra14, and the output stage quiescent current can be adjusted by Ra13.

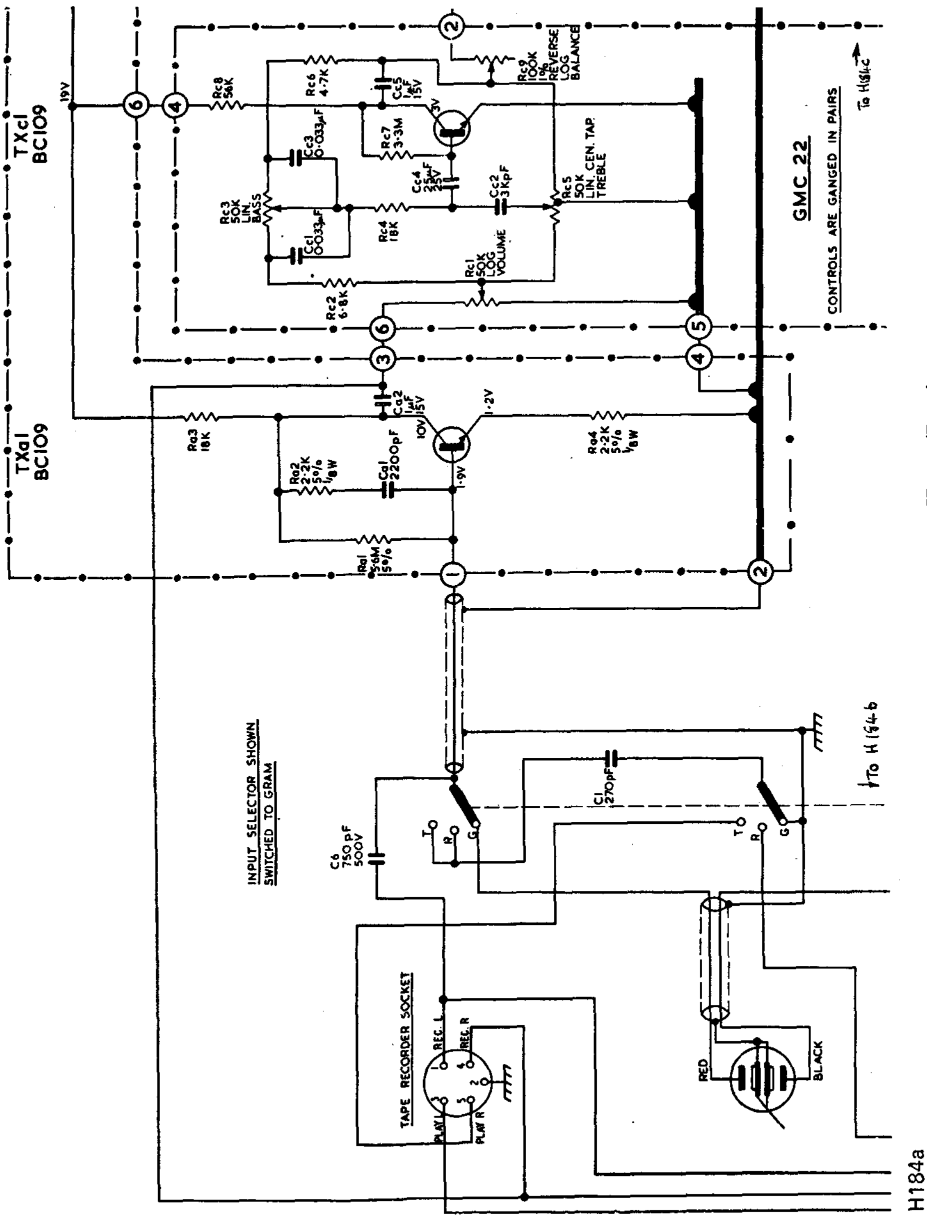
Circuit Tests and Adjustments: Allow the amplifier to warm up for about 15 minutes under normal signal conditions.

Connect in place of the loudspeakers a 6 Ω resistor and an oscilloscope. Apply a 1 kHz sine wave signal to the input via the input selector switch, and set the switch to "radio" or "tape". Adjust the amplitude of the input signal to obtain clipping of the output waveform. Adjust the pre-set resistor Ra14 in the emitter circuit of the driver stage for symmetrical clipping of the output waveform. If clipping does not occur after adjustment, increase the input signal and readjust Ra14 for symmetrical clipping.

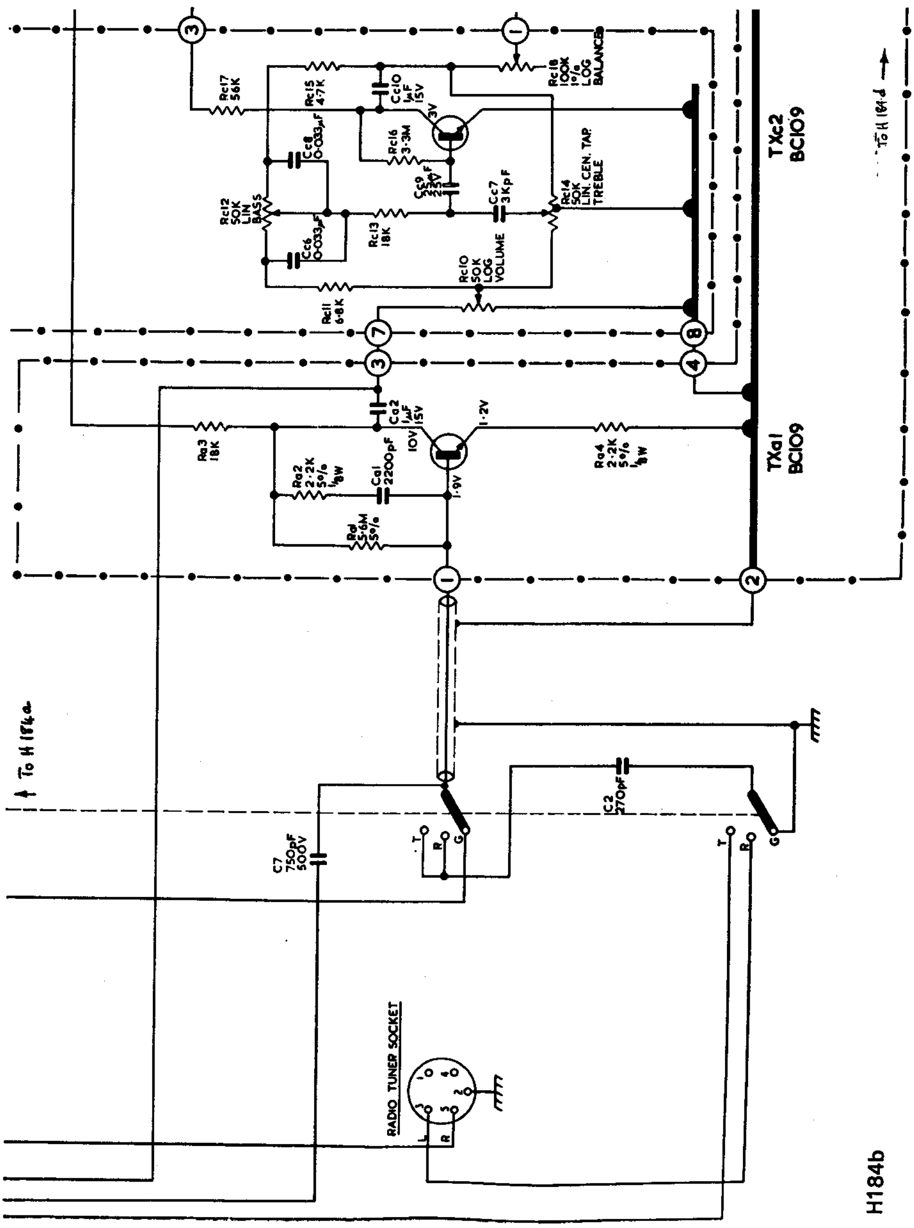
Disconnect the input signal and set the volume control to minimum. Insert a meter, capable of measuring 10 mA, in the collector lead of TXa4, by replacing the link shown in the printed circuit view of GMA20, with the meter. Adjust the pre-set resistor Ra13 to give a reading of 10 mA on the meter. Remove the meter and replace the link.

There should be negligible loss in gain between points 3 and 5 on the GMA20 modules when the volume control is set at maximum and the balance and tone controls are set to their mechanical mid positions.

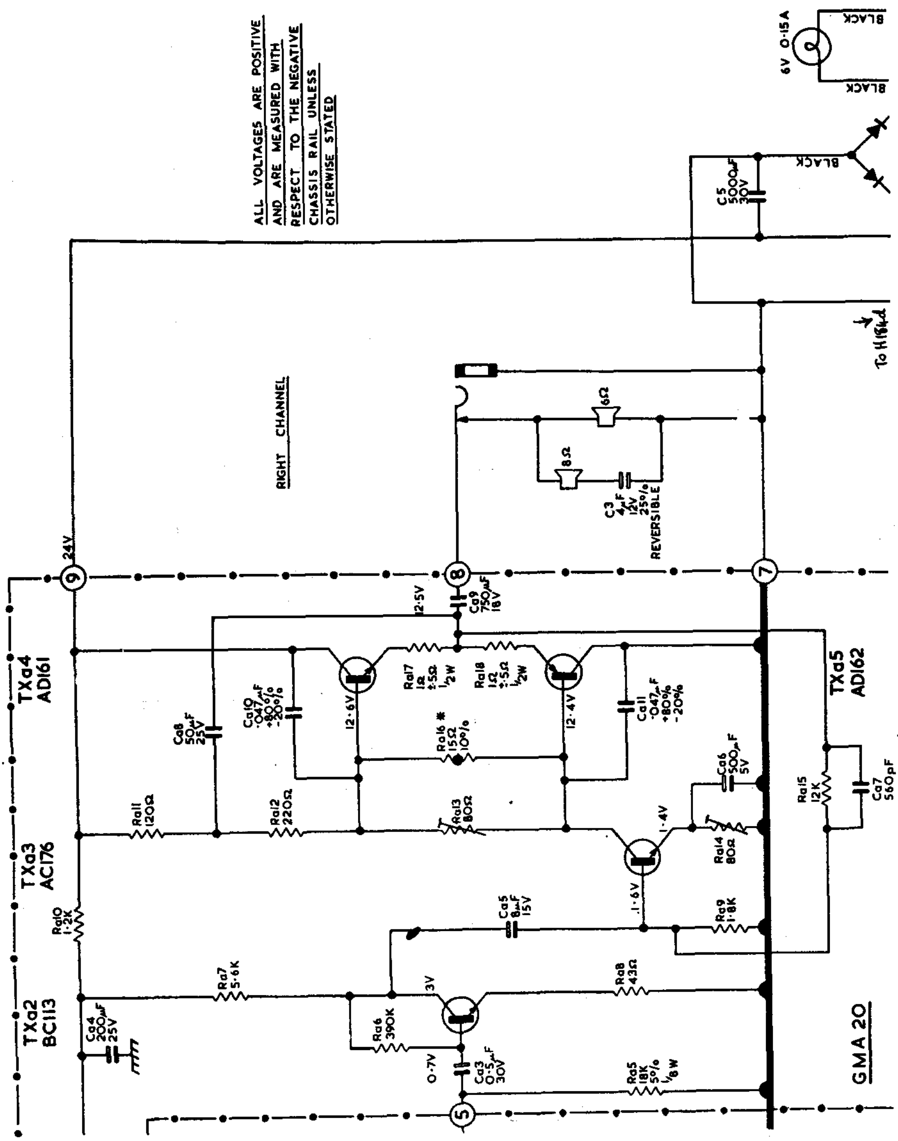
Chassis Removal: Remove the six knobs from the control panel assembly, unscrew the two Phillips screws, and lift out the control panel fascia. Place a cloth over the right-hand speaker compartment to protect the top surface, and remove the four screws holding the back panel of this compartment in place. Lift out the chassis from the top of the cabinet, easing the leads from the back of the cabinet, and lay it on the cloth.



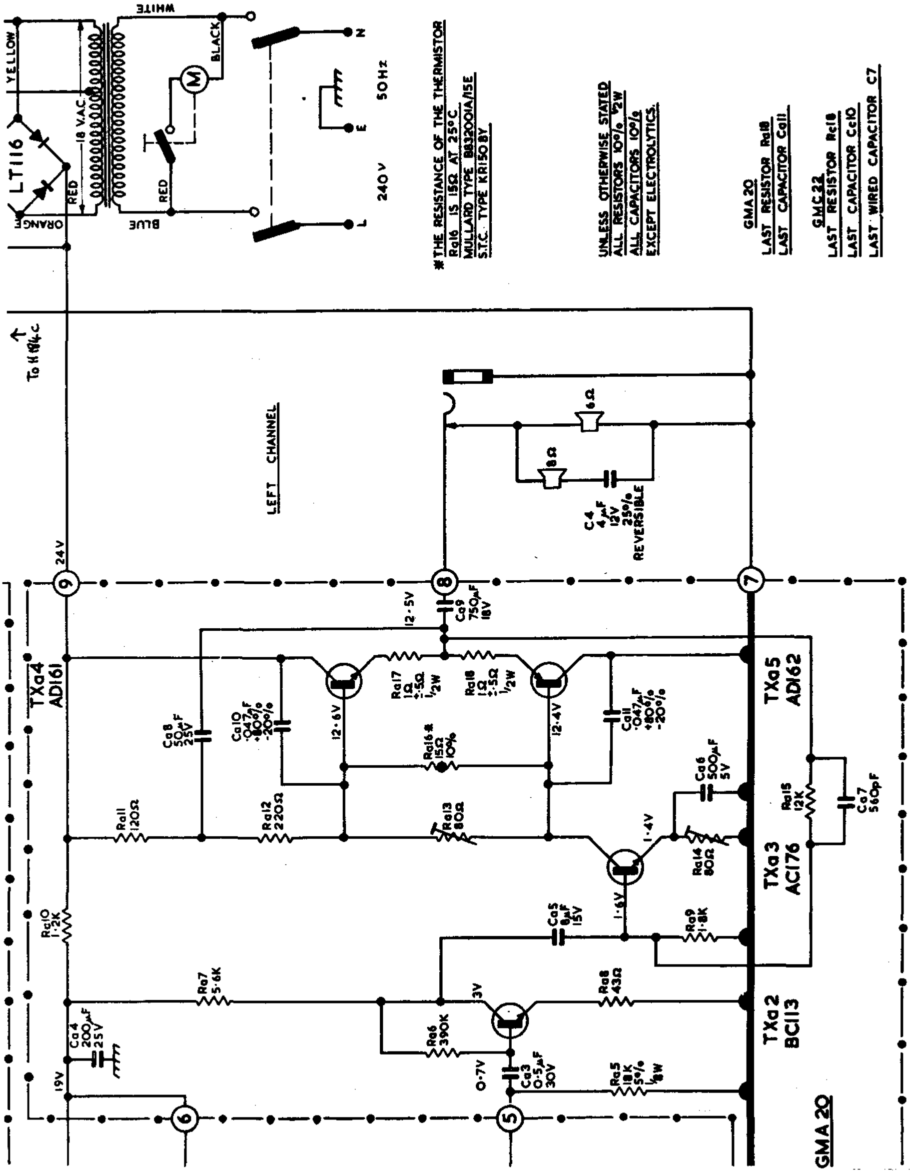
(H1842) CIRCUIT DIAGRAM—K.B. MODEL KP037 (PART)



(H184b) Circuit Diagram—K.B. Model KP037 (Part)

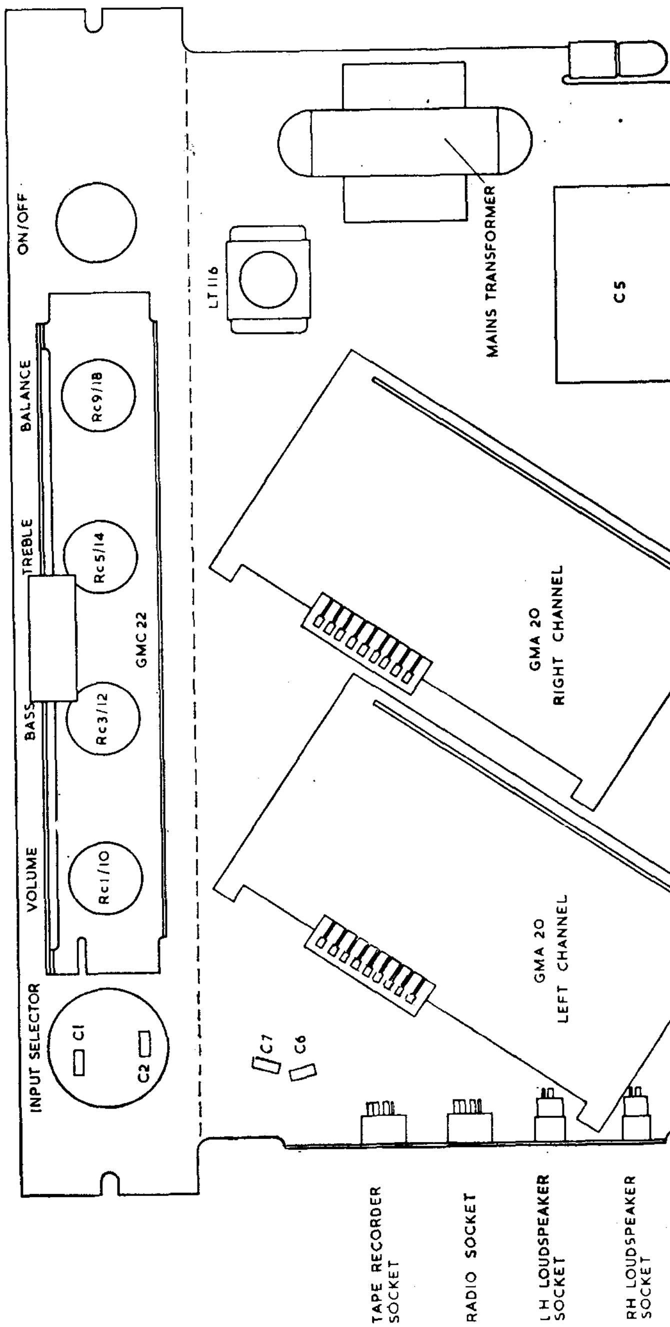


(H184c) Circuit Diagram—K.B. Model KP037 (Part)



H184d

(H184d) Circuit Diagram—K.B. Model KP037 (Continued)



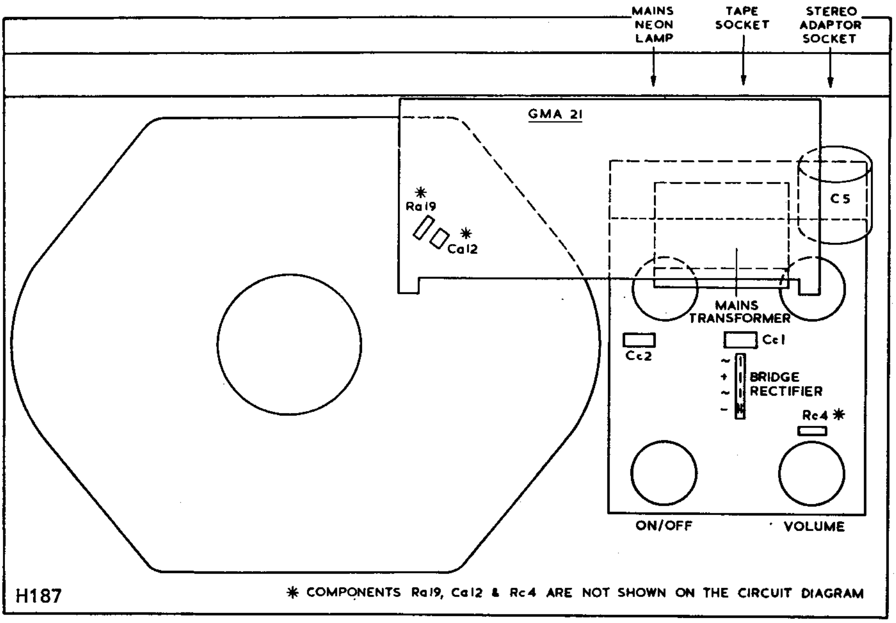
H185

(H185) Chassis Layout—Model KP307

Chassis Refitting: When refitting the chassis, push the leads back into their respective holes and pull out the mains lead as you lower the chassis down into place. Ensure that the chassis is located exactly before refitting the fascia. Finally, refit the loudspeaker compartment back panel.

K.B. Models KP038 and KA039

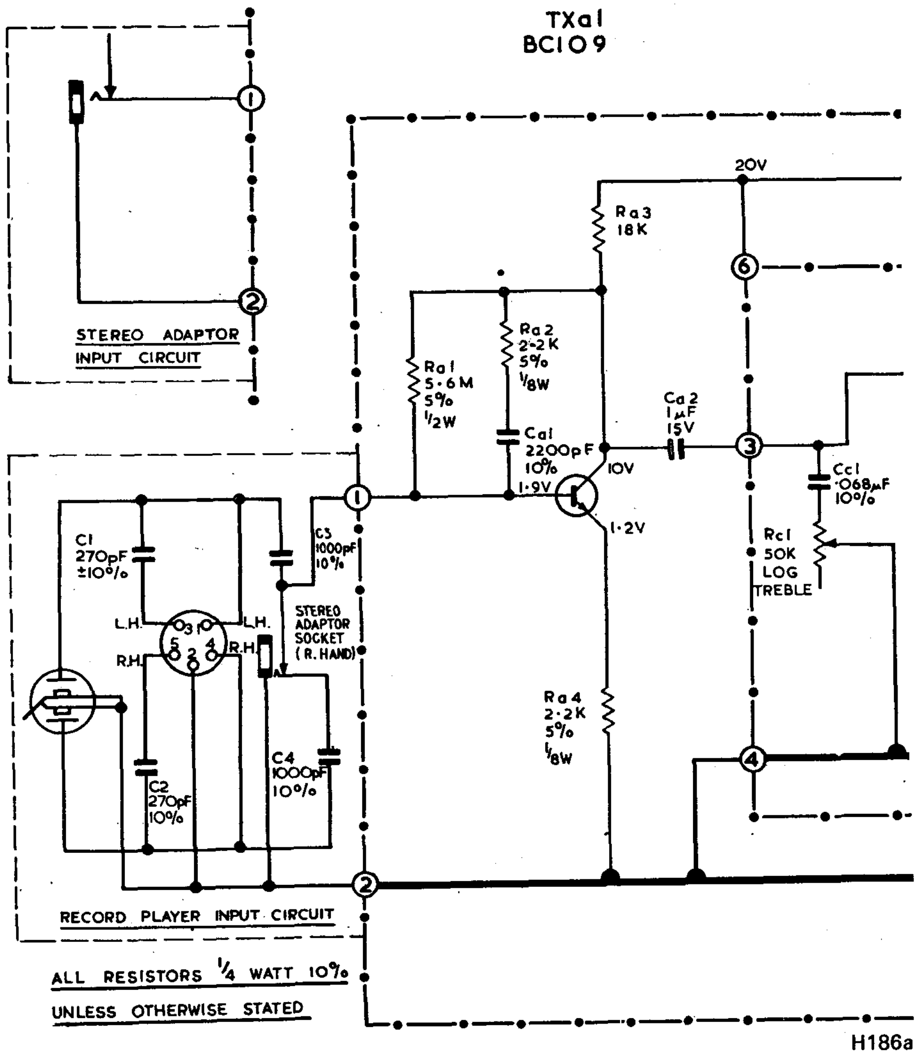
General Description: Record player (KP038) and stereo adaptor (KA039) of modular construction. Power consumption, KP038 45 VA and KA039 18 VA. Power supply, 240 V 50 Hz. Power output 7 W for 10 per cent distortion.



(H187) Layout Diagram—Models KP038 and KA039

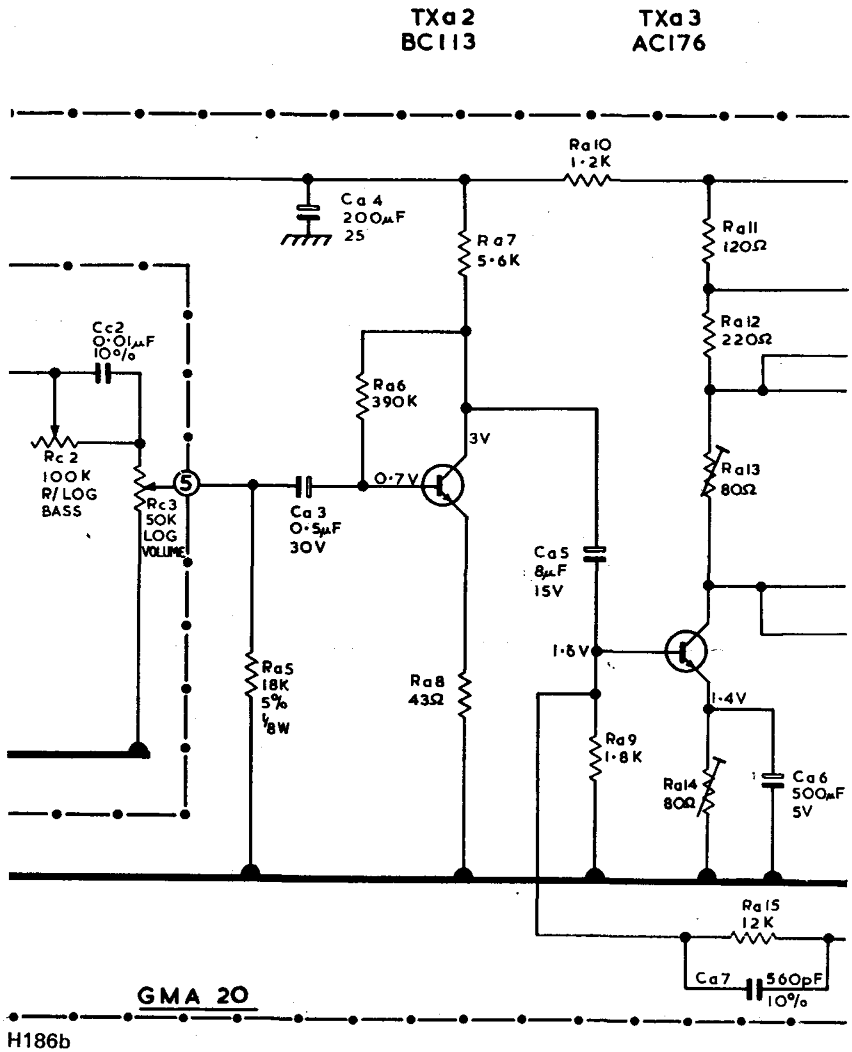
Circuit Description: The outputs from the stereo cartridge, on the record player, are connected in parallel by the player's stereo adaptor socket and directly coupled to the input of the transistor amplifier module GMA21. The stereo adaptor incorporates the same transistor amplifier as the record player. When the adaptor is plugged into the record player, the outputs from the stereo cartridge are automatically separated. The amplifier module GMA21 uses a low noise pre-amplifier transistor, TXa1, that is provided with capacitive feedback by Ra2 and Ca1 to capacitively load the cartridge. The output voltage, which is developed across Ra3 is fed via the volume and tone control network to

the pre-driver TXa2 and then on to the driver TXa3. This transistor has D.C. feedback applied to it via Ra15. The output transistors TXa4 and TXa5 function in the common emitter mode due to the A.C. referencing action of Ca8. The signal voltage is developed across Ra12 and applied between the base and emitter of each output transistor. The biasing of both the driver and output stages can be adjusted by Ra14, and the output stage quiescent current can be adjusted by Ra13.

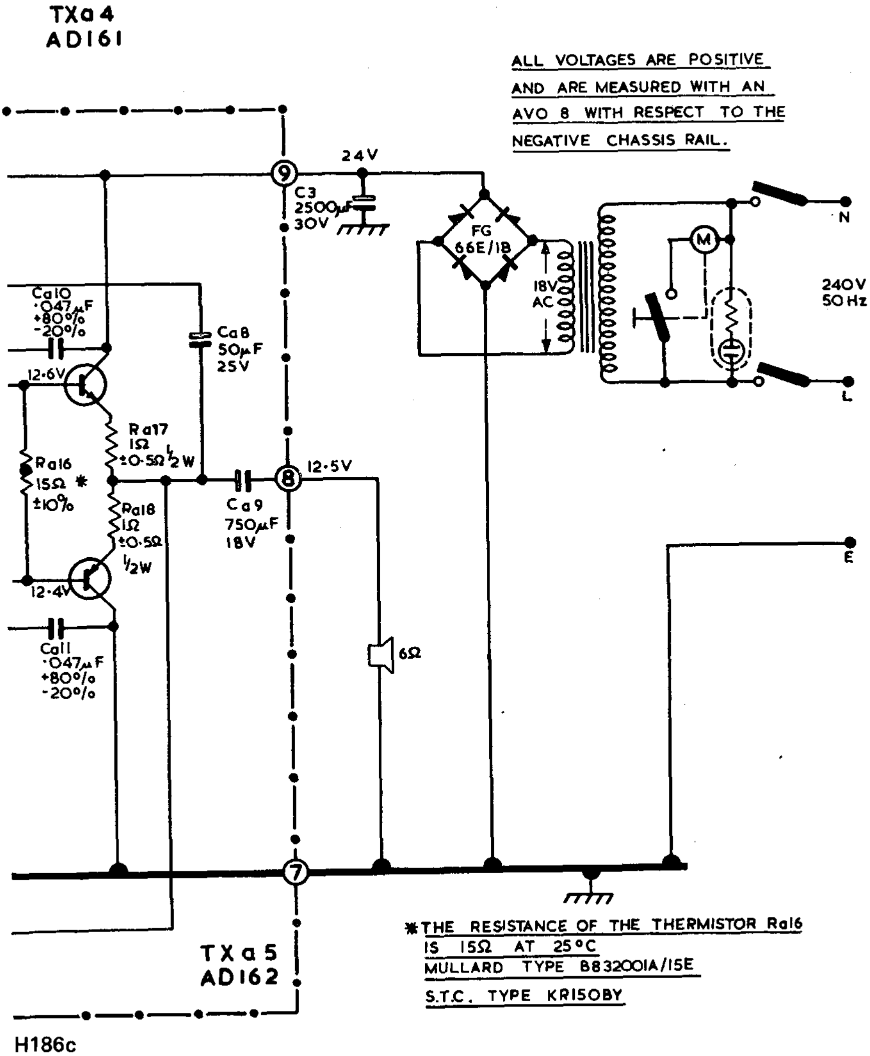


(H186a) Circuit Diagram—Models KP038 and KA039 (Part)

Chassis Removal: Remove the two Phillips screws from the loudspeaker compartment rear panel, near the top edge. Remove the two Phillips screws that are just under the fascia panel. Lift up the top of the fascia panel and grip this edge with the fingers. Grip the carrying handle and lift the bottom of the fascia panel from the front of the cabinet. Lay the fascia panel face down in front of the cabinet, being careful not to overstrain the connecting leads. To refit the panel reverse the procedure.



(H186b) Circuit Diagram—Models KP038 and KA039 (Part)



(H186c) CIRCUIT DIAGRAM—MODELS KP038 AND KA039 (CONTINUED)

Circuit Diagram Note: The amplifier module is now GMA21. This is similar to the GMA20 shown on the circuit diagram, except that a 22 K ½ W resistor (Rc4) is wired in parallel with the volume control (Rc3), and a series network consisting of a resistor 6·8 K ½ W (Ra19) and a capacitor 0·033 mfd (Ca12) is connected in parallel with Ca7 on the amplifier printed circuit board.

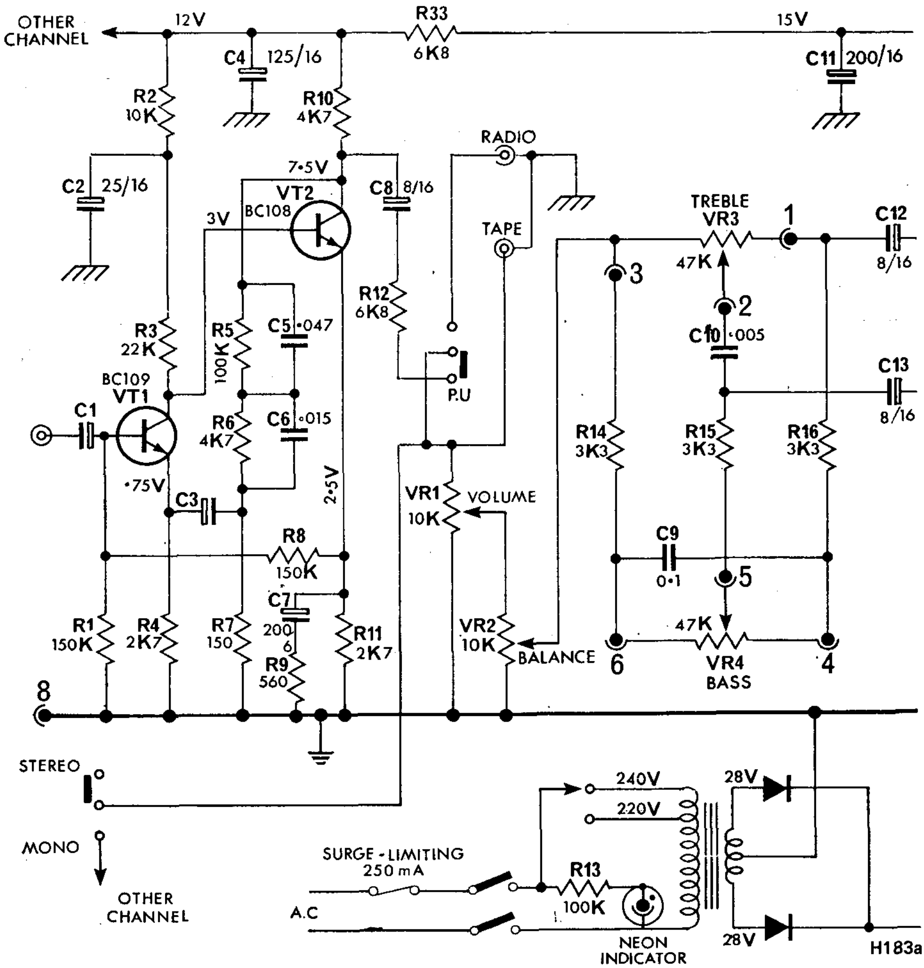
Bias Adjustment: Disconnect the cartridge from the input, and with the volume control set at maximum, use the following procedure. Set the pre-set resistors Ra13 and Ra14 to the centre of their travel. Apply a 1 kHz sine wave signal via a 1000pF capacitor to the base of the first transistor. Replace the loudspeaker by a 6 Ω resistor, and connect an oscilloscope across it. Adjust the amplitude of the input signal to obtain clipping of the output waveform. Adjust the pre-set resistor Ra14 in the emitter circuit of the driver stage for symmetrical clipping of the output waveform. If clipping does not occur after adjustment, increase the input signal and readjust Ra14 for symmetrical clipping. Disconnect the input signal, and set the volume control to minimum. Insert a meter capable of registering 10mA in the collector lead of TXa4, by replacing the link shown in the view of the printed circuit by the meter. The pre-set resistor Ra13 should now be adjusted for a reading of 10mA on the meter. Replace the link and reconnect the cartridge.

K.B. Model KR600

General Description: This model is electrically similar to the R.G.D. model RR700, which is described in this volume.

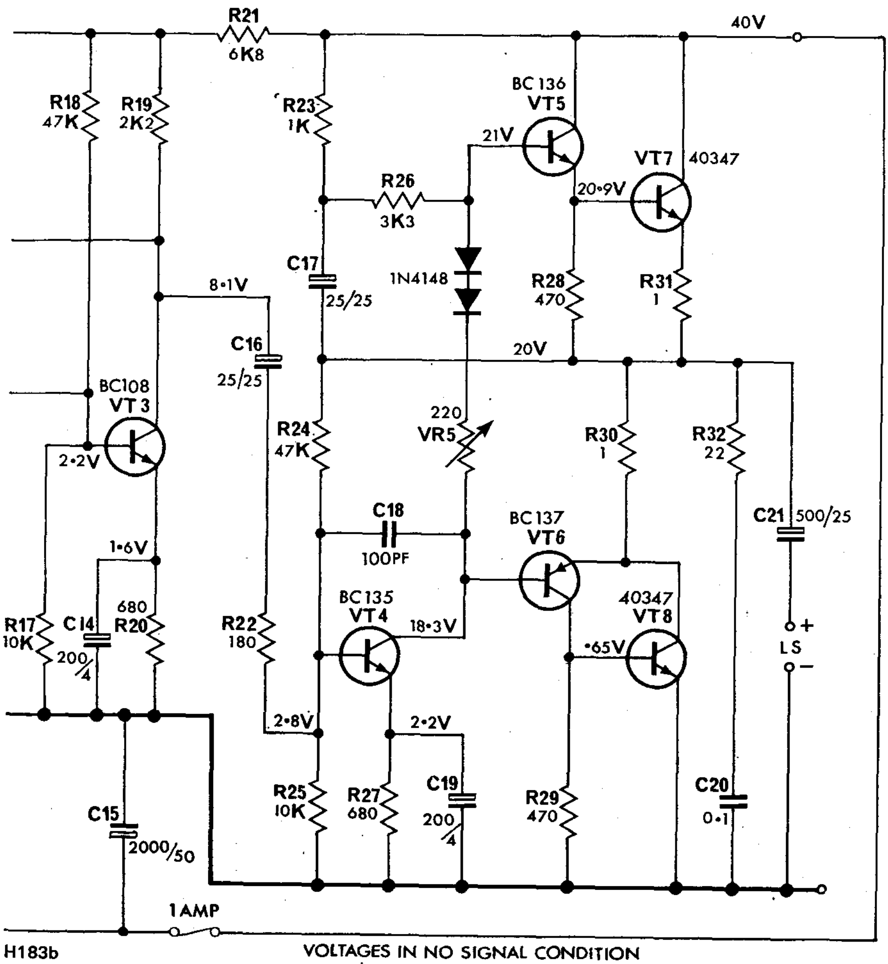
KLINGER Models KC24 and KC25

General Description: Stereo player units described in the 1968–69 volume. Subsequent modifications to increase their power output are described here and on the next page. The diagram below and opposite shows the modified circuit.



(H183a) Circuit Diagram—Models KC24 and KC25 (Part)

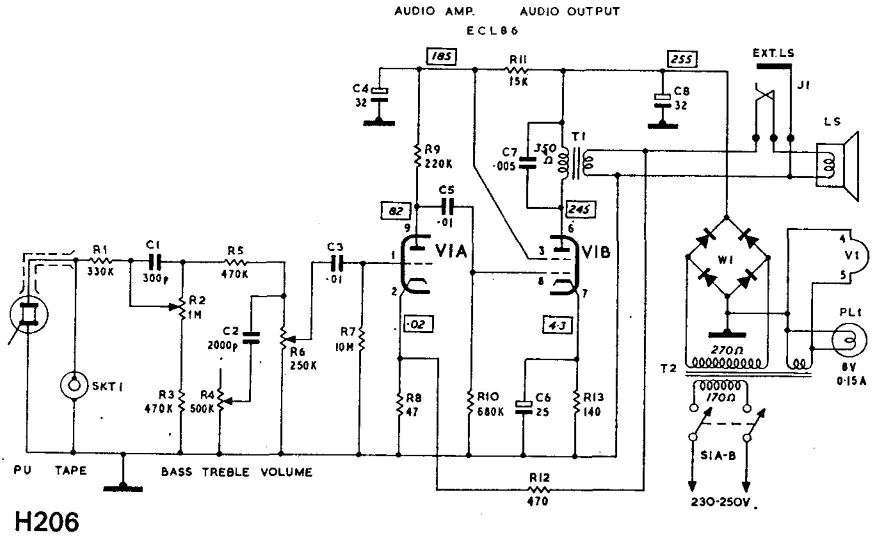
Amplifiers: The identical 9W 8 transistor amplifiers use the latest silicon semiconductors. Each amplifier is independently constructed on a modular circuit board, and subjected to searching inspection and precise matching at each stage of assembly. The pick-up pre-amplifier stages use low noise silicon devices in a circuit designed to give the matching and equalization for pick-up and recording characteristics set by international standards.



(H183b) CIRCUIT DIAGRAM—MODELS KC24 AND KC25 (CONTINUED)

MARCONIPHONE Models 4022 and 4026

General Description: Record players with an output power of 2·75 W approx. Record changer: (4022) BSR Superslim UA15 with cartridge 211, and turnover stylus ST8. Record changer: (4026) BSR UA45 with cartridge X3M and turnover stylus ST8. Loudspeaker: elliptical, 3 Ω. Mains supply: 230–250 V, 50 Hz.

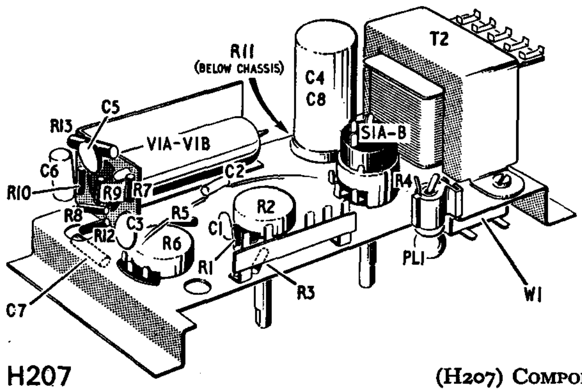


(H206) Circuit Diagram—Model 4022

Circuit Diagram Note: D.C. Voltages were measured with a 20,000 ohm/ voltmeter with a mains input of 240 V A.C.

Access for Service: Remove ventilation panel from inside cabinet (two screws). Take out screws and cup washers along edges of motor board. Pull motor board forward slightly to clear slot in back of cabinet, lift assembly, tilting slightly to clear obstructions, and rest on its rear edge diagonally across cabinet floor. To remove amplifier release mains lead and pick-up lead clamps. Pull off control knobs, then extension loudspeaker and tape connections from tag panel on amplifier chassis—noting colour coding for ease of reassembly. Remove four nuts and washers securing amplifier to front panel then lift out amplifier within limit of the inter-connecting leads. For complete removal disconnect pick-up leads from tag panel on motor baseplate, the motor leads from mains switch, and tags from loudspeaker tag panel, taking note of colour coding for reassembly.

Stylus Replacement: Use the correct stylus ST8. Place the indicator tab in the 78 or L.P. position and lift stylus arm clear of V-shaped fork in cartridge



(H207) Component Locations—Model 4022

head. Ease stylus assembly clear of securing clip. Fit the replacement stylus by raising the securing clip with thumbnail, insert stylus back stock and gentle pressure will click the stylus arm into position. Make sure stylus arm fits into V-shaped fork in cartridge head.

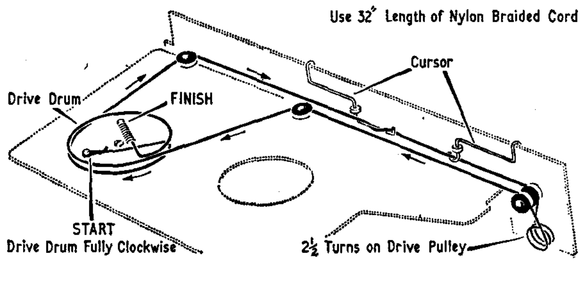
MARCONIPHONE Model 4028

General Description: This model is basically similar to the H.M.V. model 2040, which is described on earlier pages of this section of this volume.

MARCONIPHONE Model 4159

General Description: Portable radio receiver with 600mW output. Aerials: ferrite rod for M.W. and L.W., telescopic rod for S.W. Battery: two 9V (PP7). Loudspeaker: round, 35Ω. Sockets: car aerial and earphone or tape (15Ω minimum).

Access for Service: Slide open battery cover then disconnect and take out batteries. Complete access to the printed board may be gained by removing the

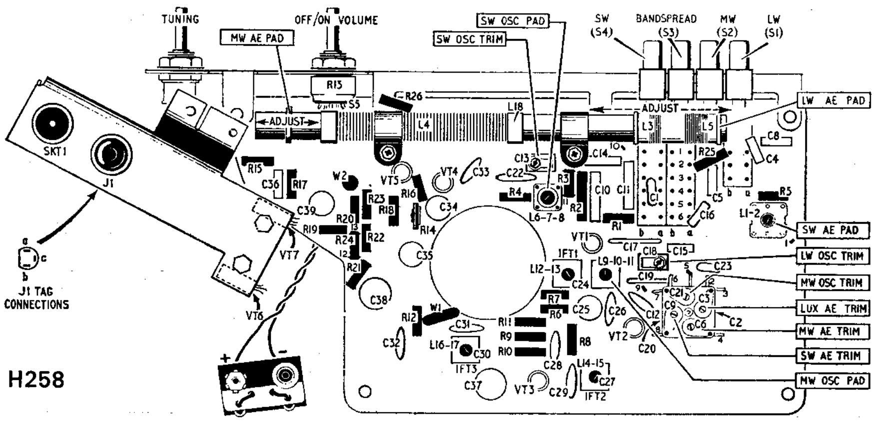


(H259) Drive Cord —Model 4159

cabinet back cover which is retained by three countersunk screws in the cabinet base. For access to the drive cord and the copper side of the printed board, pull off control knobs and unsolder lead on telescopic aerial. Take out five screws and washers securing printed board, then unsolder leads on loudspeaker tag panel. The printed board may then be lifted out without further disconnection.

Tag Connections:

1. To tag 8 and S4A contact 6.
2. To S4A contact 5 and C23.
3. To S3A contact 3.
4. To S3A contact 1.
5. To C23.
6. To S4B contact 2.
7. To S3B contact 4.
8. To tag 1.
9. To S4B contact 4.
10. To L3.
11. To S4B contact 5.
12. To J1 contact "c".
13. To J1 contact "a".



(H258) Component Locations—Model 4159

Heat Sink Components: Whenever transistors (sleeved or unsleeved types) are used in heat sinks it is essential for the preservation of a low thermal resistance that there should be no air-space between the outside surface of the transistor and the inside of the heat sink. In the case of small transistors in cylindrical encapsulation, this air-space must be filled by the application of a suitable heat conducting grease and the transistor pushed fully into its sink. Although the heat sink grease is applied during production it must always be reapplied by the engineer when replacing a transistor during servicing. Heat sink compound DP2623, or anti-tracking grease MS4, is suitable.

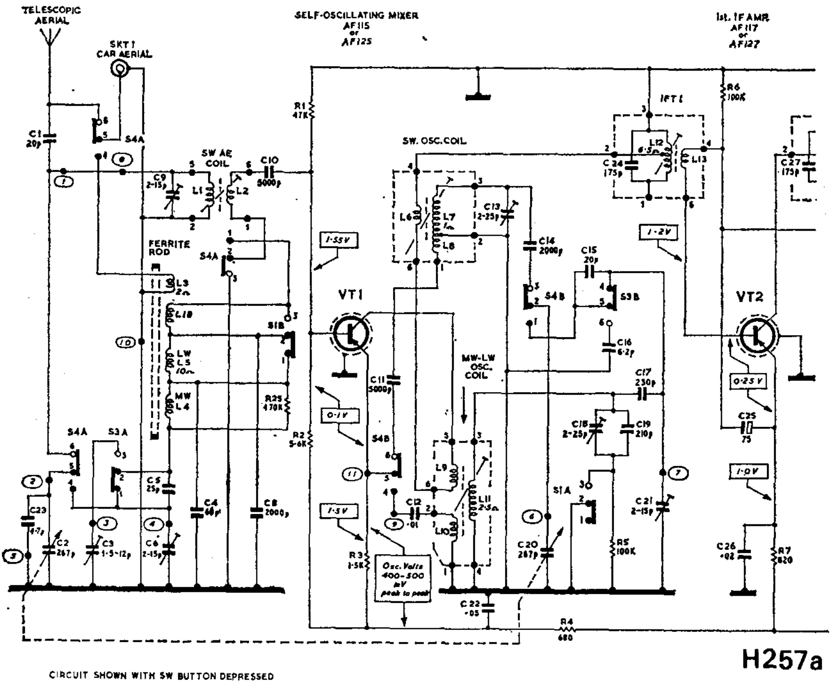
Balance Adjustment: Output transistors VT6 and VT7 are series connected across the 18 V battery supply, and to ensure a balanced supply voltage to each an adjustment R14 is incorporated in emitter circuit of VT4. Adjustment of this resistor sets emitter potential and hence collector potential of VT4. It will, therefore, determine the base potential of driver VT5 which is directly coupled to VT4. This bias decides collector potential of VT5 which in turn controls base voltages of VT6 and VT7. Correct balance is obtained when potential of VT6/VT7 emitter junction is 10 V with respect to positive line. The discrepancy from half-battery voltage is due to the emitter bias

voltage developed across R18 which determines limit of negative signal excursion before bottoming of VT5 takes place.

Complementary Output Stage: PNP and NPN type transistors are used in conjunction with a stabilizing diode to provide a transformerless power stage giving an audio output of 600mW.

The audio signal developed across volume control R13 is applied via coupling capacitor C33 to the base of audio amplifier transistor VT4. The amplified signal appearing at the collector of VT4. is directly coupled to the base of driver transistor VT5. The output from VT5 simultaneously drives the bases of both output transistors VT6 and VT7. During positive half-cycles of the signal, NPN transistor (VT7) conducts, resulting in a fall in collector/emitter voltage of VT7. During negative half-cycles of the signal PNP transistor (VT6) conducts, resulting in an increase in collector/emitter voltage of VT7. The loudspeaker is fed via C39 and J1.

VT5 collector load R19 is returned to "live" side of the loudspeaker and, as this point is coupled to the emitters of VT6 and VT7 through C39, the input



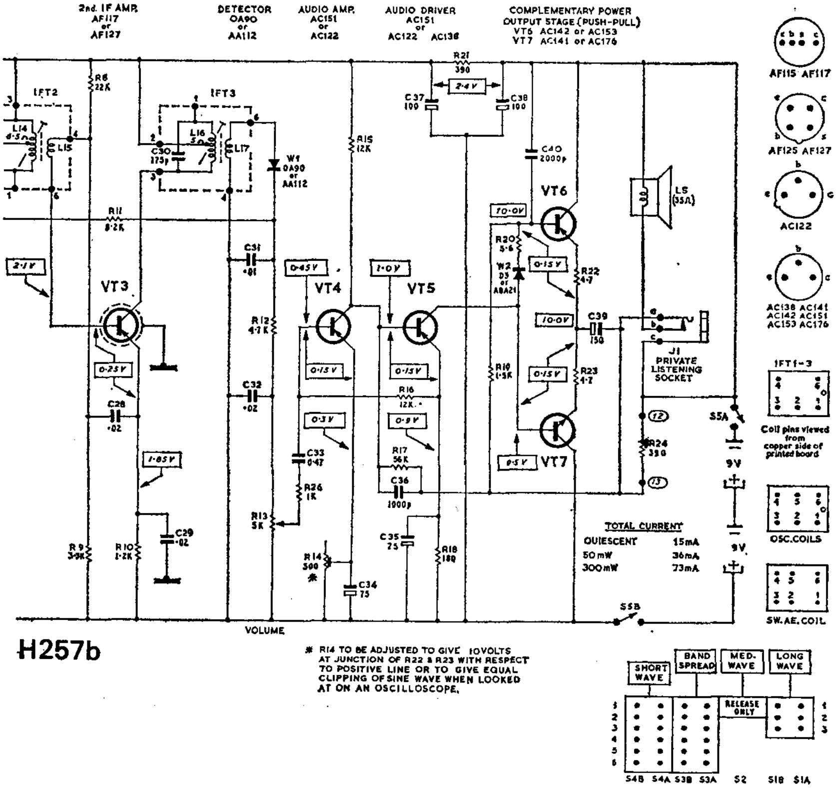
Circuit Diagram Notes: Figures in rectangles indicate voltages measured with a 20,000 ohm/volt meter between positive line of each transistor and point shown, except where otherwise indicated. D.C. resistance readings are shown against inductors where these are 1 Ω or greater. Ringed figures show printed board tag connection points.

(H257a) Circuit Diagram—Model 4159 (Part)

signal to the output stage is virtually applied between base and emitter of both VT6 and VT7.

The diode is biased by VT5 collector current and acts as a variable resistance which is sensitive to voltage and temperature variations. The resistance value of W2 is small compared with R19 and the voltage developed across W2 equals the sum of the nominal output transistor (VT6 and VT7) base/emitter voltages and so determines the correct quiescent operating conditions. During low ambient temperature conditions the resistance of W2 increases thus compensating for falling current of the output transistors. This effect also takes place in the event of falling battery voltage. The diode W2 also assists thermal stability at high temperatures and opposes high current drain from the batteries.

Alignment (General): Remove cabinet back cover only, then connect an output meter, set to 35 Ω impedance, in place of loudspeaker via jack plug connection to J1. Alternatively, connect a Model 8 Avometer (10 V A.C. range across speech coil via tags 12 and 13 on printed board. Set volume control to maximum but, during alignment, adjust signal generator output level to maintain receiver output at 50 mW.



(H257b) Circuit Diagram—Model 4159 (Continued)

Alignment (I.F.): Switch receiver to medium waveband and turn gang to maximum capacitance. Apply a 475 kHz (30 per cent modulated) signal, via a 0·1 μF blocking capacitor, across C2 (aerial section of gang) then adjust I.F. T3, I.F. T2 and I.F. T1 (in that order) for maximum output. Repeat until no further improvement results.

Alignment (R.F.): Inject M.W. and L.W. signals, via a loop loosely coupled to the ferrite rod aerial. On S.W. extend telescopic aerial and place signal generator lead nearby to provide a loose coupling. Check that, with tuning gang fully closed, the cursors coincide with the marker pip at right-hand end of M.W. and L.W. scales.

Waverange	*Signal Generator*	*Tune to*	*Adjust*
Medium	600 kHz	500 metres	L11, L4*
Bandspread	1500 kHz	200 metres	C21
Medium	1500 kHz	Max. output at 200 metres	C6
Bandspread	1500 kHz	200 metres	C3
Repeat as necessary for accurate calibration and maximum output.			
Long	200 Kc/s	1500 metres	C18, L5†
Short	7 MHz	7 MHz	L7, L1
Short	16 MHz	16 MHz	C13, C9‡
Repeat as necessary for accurate calibration and maximum output			

* Adjust by sliding ring along ferrite rod.
† Adjust by sliding coil former along ferrite rod.
‡ "Pulling" which may occur whilst tuning C9 should be counteracted by "rocking" the gang.

MARCONIPHONE Model 4160

General Description: This model is electrically similar to the Ultra model 6160, which is described in this volume on later pages.

MARCONIPHONE Model 4320

General Description: This model is electrically similar to the H.M.V. model 2332, which is described in earlier pages of this volume.

MARCONIPHONE Model 4342

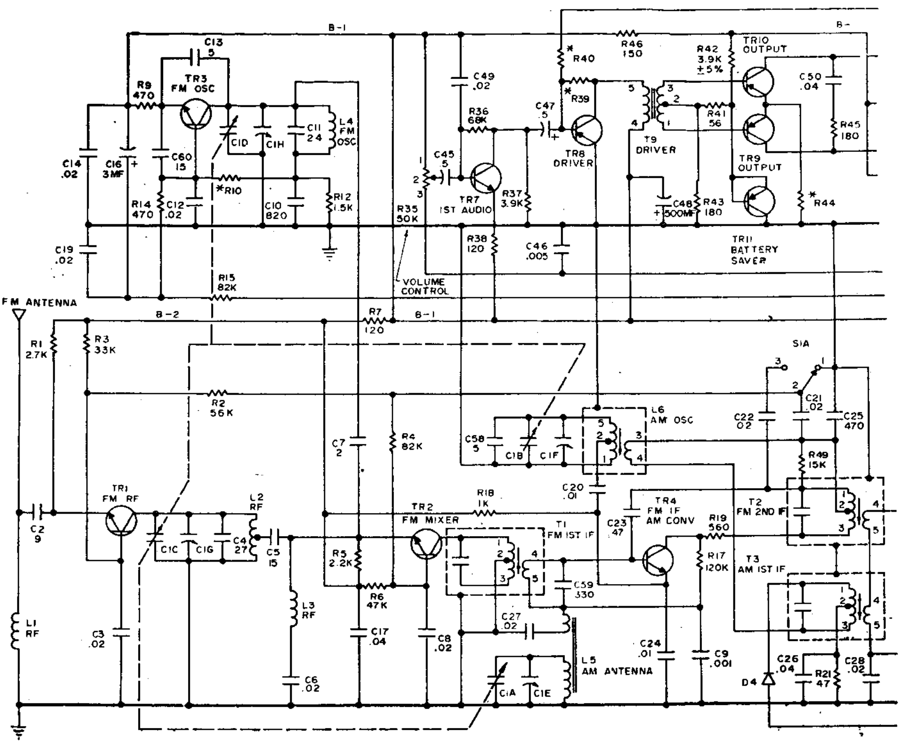
General Description: This model is electrically similar to the H.M.V. model 2342, which is described earlier in this volume.

MONOGRAM — Model UOP1820

General Description: Eleven-transistor A.M./F.M. portable radio. Ferrite rod aerial for A.M. reception and a telescopic aerial for F.M. reception. Power output: 200 mW undistorted, 340 mW maximum. Power supply: 6 V D.C. Wavebands: A.M. 540–1600 kc/s; F.M. 88–108 Mc/s.

Alignment: A.M.

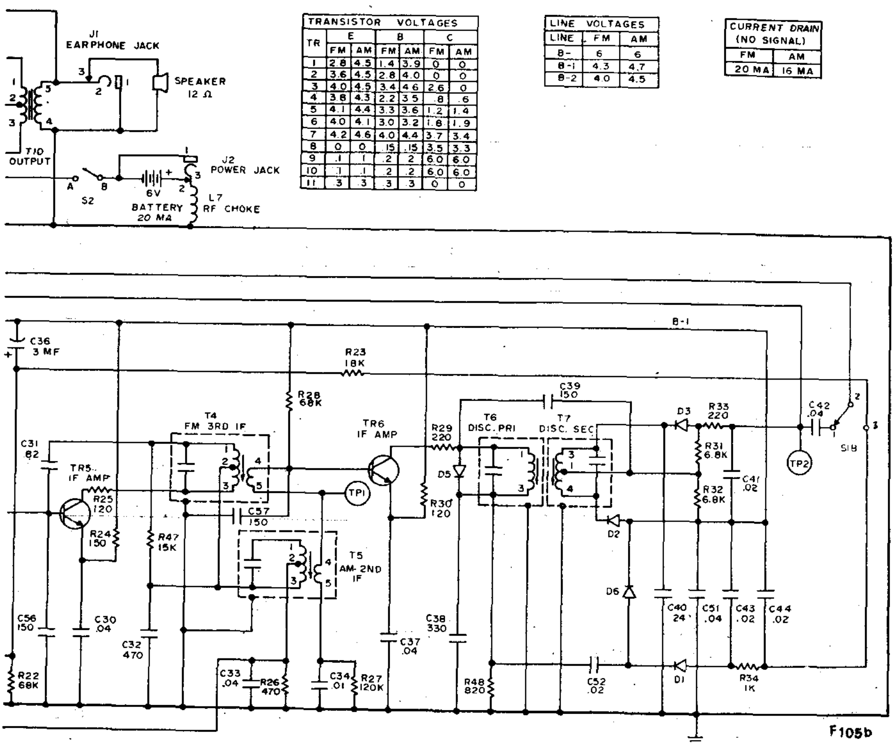
Step	*Signal generator*	*Generator setting*	*Tuning gang*	*Connect scope or output meter*	*Adjustments*
1	Radiate output to L5	455 kc. Modulated 400 cycles at 30 per cent	Open	Voice coil	T3, T5 and T8 for maximum amplitude
2	Repeat Step 1				
3	Radiate output to L5	1630 kc	Open	Voice coil	Oscillator trimmer C1F for maximum
4	Same	1400 kc	1400 kc	Voice coil	Peak antenna trimmer C1E while rocking gang
5	Same	580 kc	580 kc	Voice coil	A.M. Oscillator L6 for maximum while rocking gang
6	Repeat Steps 3–5 as necessary				



(F105a) Circuit Diagram—Model UOP 1820 (Part)

Alignment: F.M.

Step	*Signal generator*	*Generator setting*	*Tuning gang*	*V.T.V.M. connection*	*Adjustment*	*Notes*
1	Couple output in series with 15 μF capacitor to emitter of TR2	10·7 Mc. A.M. Modulated at 30 per cent	Open	Across R27	T1, T2, T4 for maximum gain	Keep gen. output level as low as possible. Band switch in F.M. position. TR6 collector shorted to gnd.
2	Same	Same	Open	In series with a 22k resistor to TP2 and gnd.	Adjust T6 for max. amplitude	Detune T7
3	Same	Same	Open	In series with a 22k resistor to TP2 and gnd.	T7 for sharp null	Same
4	Repeat all steps					
5	Couple output across L1 and with the whip disconnected	108·25 Mc. A.M. Modulated at 30 per cent	Open	Across R27	Adjust trimmers C1H and C1G for max. amplitude	Use weakest possible signal
6	Same	87·75 Mc. A.M. Modulated at 30 per cent	Closed	Across R27	Adjust coils L4 and L2 for max. amplitude	TR6 collector shorted



TRANSISTOR VOLTAGES						
TR	E		B		C	
	FM	AM	FM	AM	FM	AM
1	2.8	4.5	1.4	3.9	0	0
2	3.6	4.5	2.8	4.0	0	0
3	4.0	4.5	3.4	4.6	2.6	0
4	3.8	4.3	2.2	3.5	.8	.6
5	4.1	4.4	3.3	3.6	1.2	1.4
6	4.0	4.1	3.0	3.2	1.8	1.9
7	4.2	4.6	4.0	4.4	3.7	3.4
8	0	0	.15	.15	3.5	3.3
9	.1	1	.2	2	6.0	6.0
10	.1	.1	.2	.2	6.0	6.0
11	.3	.3	.3	.3	0	0

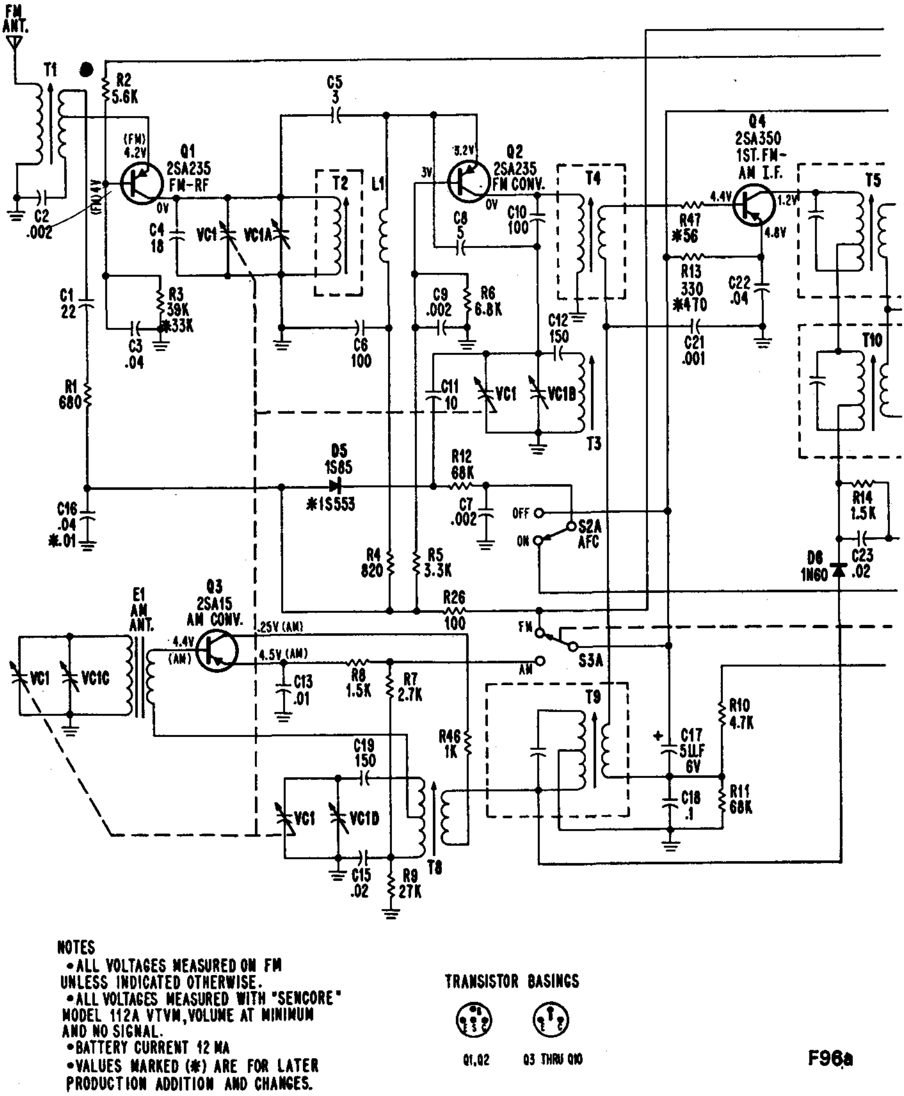
LINE VOLTAGES		
LINE	FM	AM
B-	6	6
B-1	4.3	4.7
B-2	4.0	4.5

CURRENT DRAIN (NO SIGNAL)	
FM	AM
20 MA	16 MA

(F105b) Circuit Diagram—Model UOP 1820 (Continued)

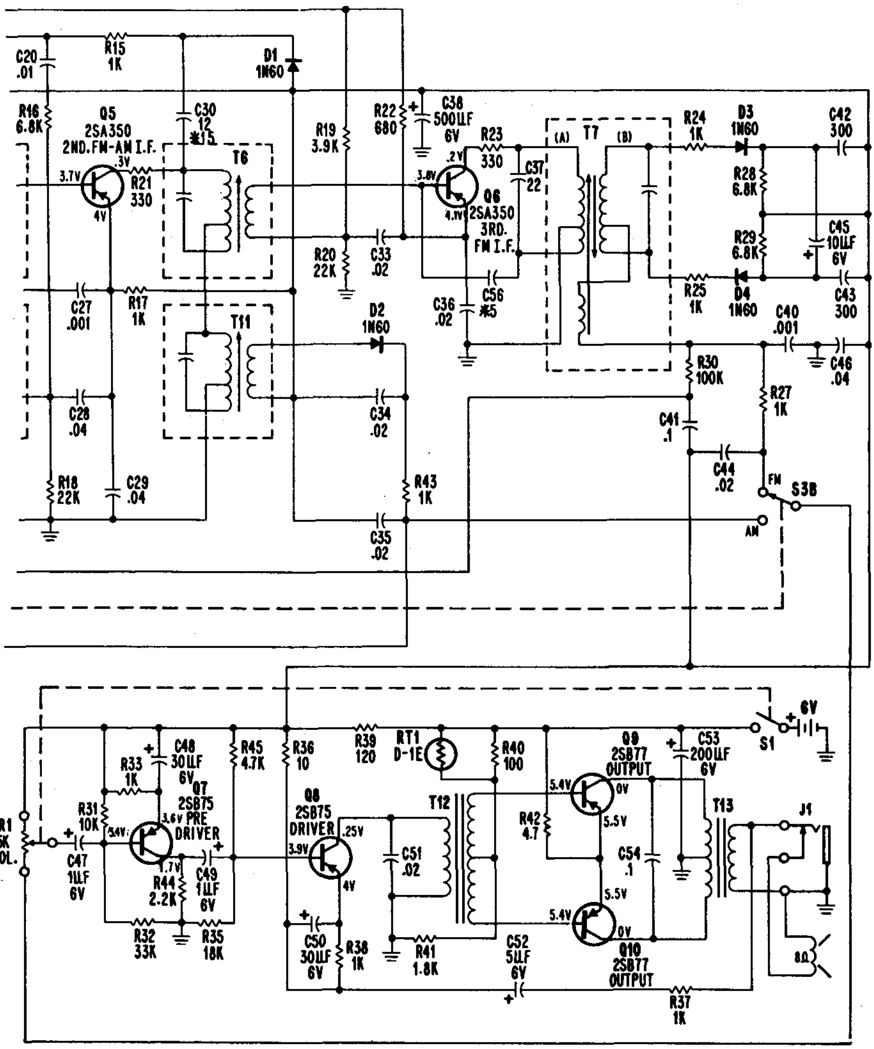
PHILCO Model QT93

General Description: Ten-transistor, six-diode and one-thermistor A.M./F.M. receiver. Wavebands: M.W. 540–1600kc/s; F.M. 88–108Mc/s. Loudspeaker 2½ in. diameter, 8 Ω impedance.



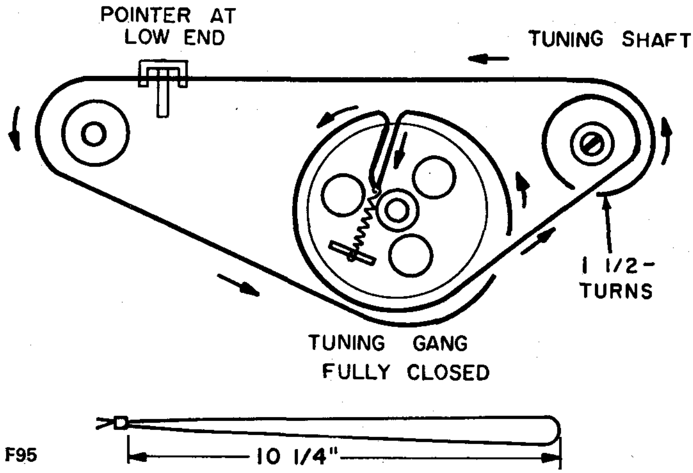
(F96a) Circuit Diagram—Model QT93 (Part)

Dismantling: Remove cross recess screw from bottom of F.M. aerial and slide aerial up and remove from cabinet. Remove centre chassis mounting stud and five cross recess chassis mounting screws. Carefully remove chassis by lifting right side to clear knobs from cabinet. Speaker, earphone jack and switches may remain in cabinet while servicing.



F96b

(F96b) Circuit Diagram—Model QT93 (Continued)



(F95) DRIVE CORD—
MODEL QT93

F.M. Alignment: Refer to A.M. alignment preliminary instructions. Set band switch to F.M. position.

	Signal generator		*Radio*		
Step	*Connection to radio*	*Dial setting*	*Dial setting*	*Special instructions*	*Adjust*
1	Emitter of Q2 through 0·01 MF. cap	10·7 Mc. ±500 kc. sweep	Tuning gang fully open	Adjust for maximum output in order given. Reduce generator output as necessary	T7A, T6, T5, T4
2	Same as Step 1	10·7 Mc. 30% A.M.	Tuning gang fully open	Adjust for minimum output	T7B
3	Repeat Steps 1 and 2 until no further improvement is obtained				
4	Use radiating loop. (See Note 2 on next page)	86·2 Mc. 30% F.M.	Tuning gang fully closed	Adjust for max. output	T3 F.M. osc.
5	Same as Step 4	108·8 Mc. 30% F.M.	Tuning gang fully open	Adjust for max. output	VC1B F.M. osc.
6	Same as Step 4	87 Mc. 30% F.M.	87 Mc.	Adjust for max. output	T1, T2 (See Note 1 below)
7	Same as Step 4	108 Mc. 30% F.M.	108 Mc.	Adjust for max. output	VC1A (Note 1 below)
8	Repeat Steps 4 and 5 until no further improvement is obtained				
9	Repeat Steps 6 and 7 until no further improvement is obtained				

Note 1: When tracking is off adjust T2 and VC1A. Keep tuning correct by adjusting VC1B. Osc. frequency may vary slightly when T2 and VC1A are adjusted.

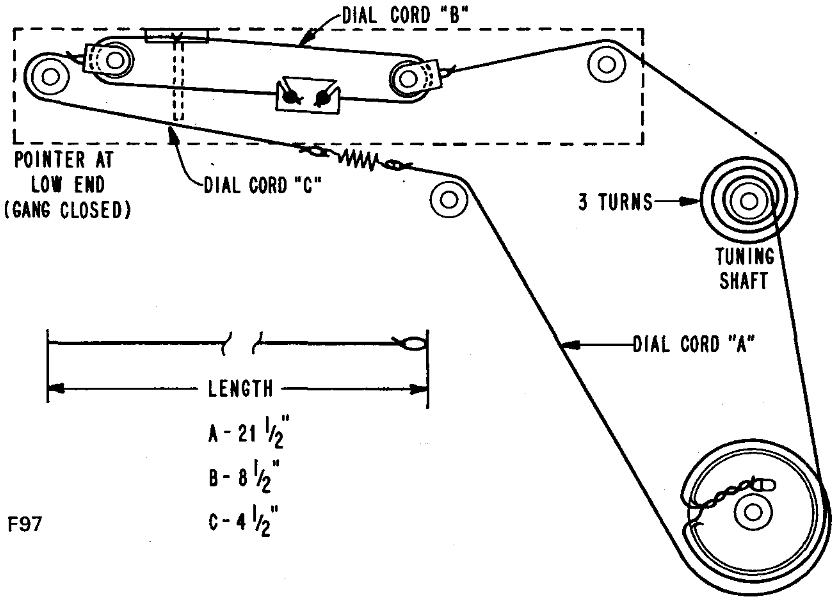
A.M. Alignment: Allow test equipment 15 minutes to warm up and stabilize. Set band switch to A.M. position. Insert earphone plug paralleled with an 8 Ω resistor into the earphone jack, J1. Connect V.T.V.M. across the 8 Ω resistor. Connect generator leads as indicated in chart. Keep generator output as low as possible to avoid A.G.C. action. Set volume control to maximum.

Signal generator			Radio		
Step	*Connection to radio*	*Dial setting*	*Dial setting*	*Special instructions*	*Adjust*
1	Radiating loop (See Note 2 below	455 kc.	Tuning gang fully open	Adjust for max. output in order given	T11 T10 T9 T8
2	Same as Step 1	540 kc.	Tuning gang fully closed	Adjust for max. output	A.M. osc.
3	Same as Step 1	1600 kc.	Tuning gang fully open	Adjust for max. output	VC1D A.M. osc.
4	Repeat Steps 2 and 3 until no further improvement is obtained				
5	Same as Step 1	600 kc.	600 kc	Adjust for max. output by sliding ant. coil on core	E1 A.M. ant.
6	Same as Step 1	1400 kc.	1400 kc.	Adjust for max. output	VC1C
7	Repeat Steps 5 and 6 until no further improvement is obtained				

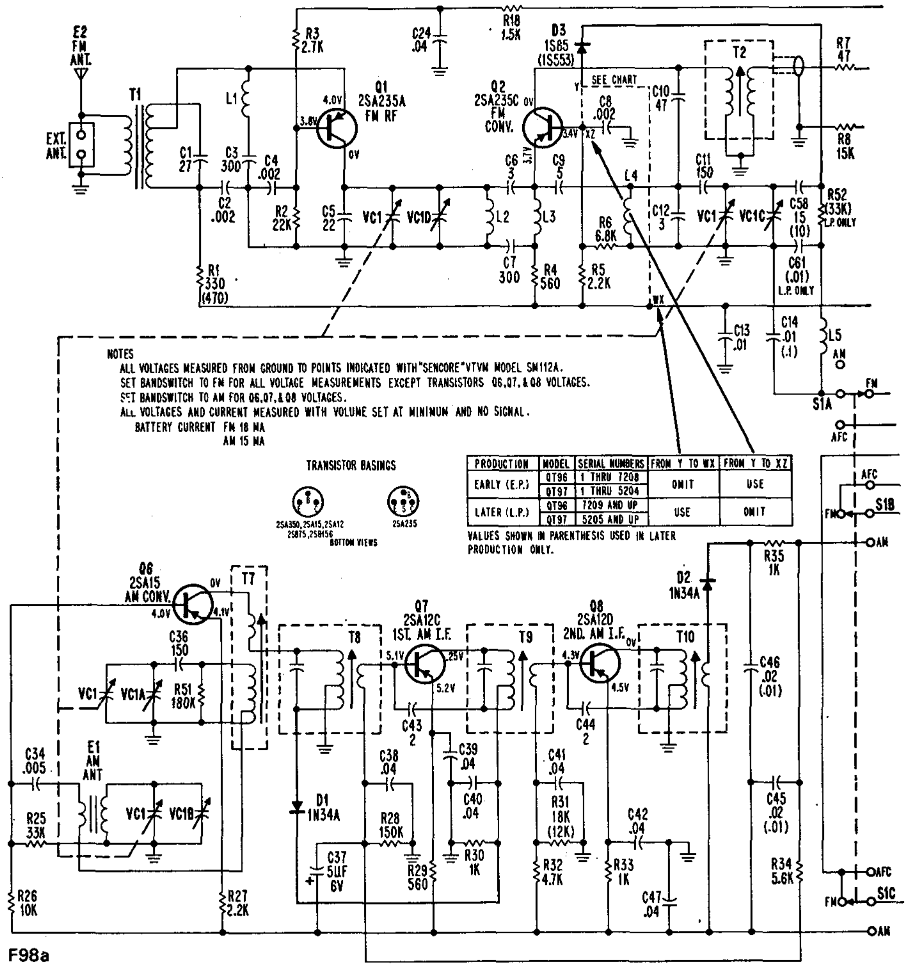
Note 2: Radiating loop is made of 6 to 8 turns of insulated wire on a 6 inch diameter. Connect to generator terminals and place about 12 inches from radio.

PHILCO Models QT96 and QT97

General Description: Twelve-transistor, six-diode and one-thermistor A.M./F.M. receiver. Wavebands: M.W. 540–1600 kc/s; F.M. 88–108 Mc/s. Loudspeaker 3 × 5 in., 8 Ω impedance.



(F97) Drive Cord—Models QT96/97

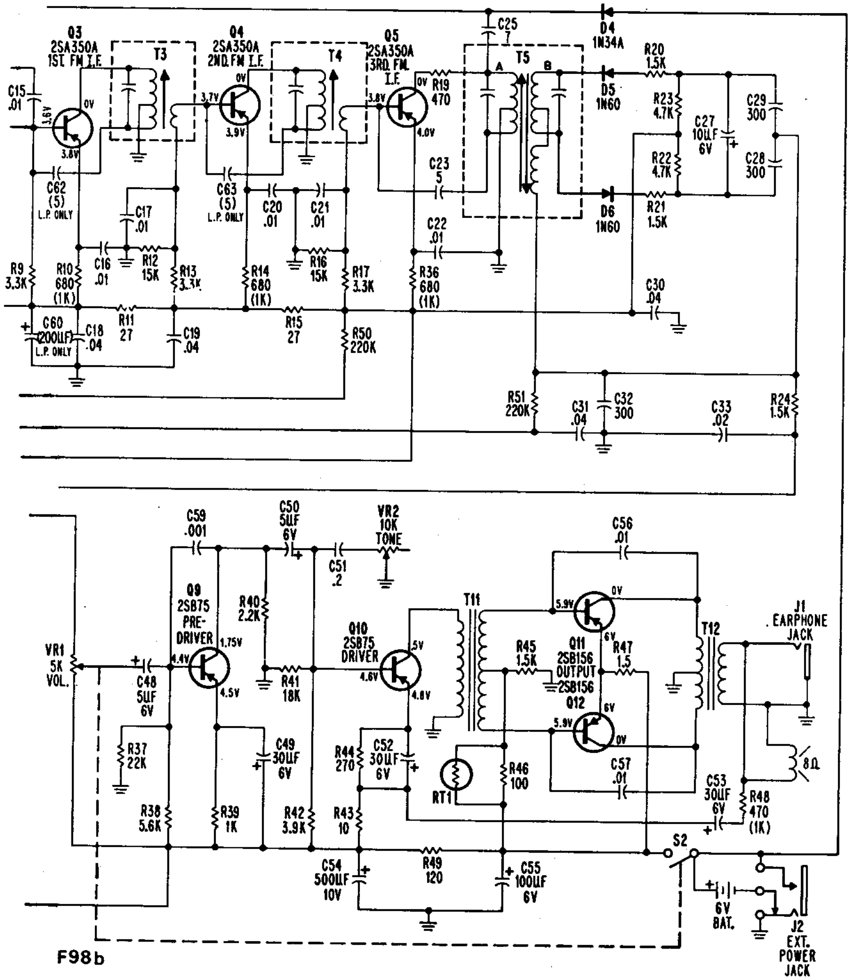


F98a

(F98a) Circuit Diagram—Models QT96/97 (Part). The Remainder is Illustrated Opposite (F98b)

Dismantling: Remove control knobs volume, tone, A.F.C. and tuning. Remove nut holding earphone jack. Remove mounting screw at "Ext. Power" jack. Remove four nuts and two panel mounting studs.

A.M. Alignment: Allow test equipment 15 minutes to warm up and stabilize. Set band switch to A.M. position. Insert earphone plug paralleled with an 8 Ω resistor into the earphone jack, J1. Connect V.T.V.M. across the 8 Ω resistor. Connect generator leads as indicated in chart. Keep generator output as low as possible to avoid A.G.C. action. Set volume control to maximum.



F98b

Step	Signal generator: Connection to radio	Signal generator: Dial setting	Connection to radio: Dial setting	Special instructions	Adjust
1	Radiating loop (See Note 1)	455 kc.	Tuning gang fully open	Adjust for max. output in order given	T10 T9 T8 T7
2	Same as Step 1	540 kc.	Tuning gang fully closed	Adjust for max. output	A.M. osc.
3	Same as Step 1	1600 kc.	Tuning gang fully open	Adjust for max. output	VC1A
4	Repeat Steps 2 and 3 until no further improvement is obtained				A.M. osc.
5	Same as Step 1	600 kc.	600 kc.	Adjust for max. output by sliding ant. coil on core	A.M. ant.
6	Same as Step 1	1400 kc.	1400 kc.	Adjust for max. output	VC1B
7	Repeat Steps 5 and 6 until no further improvement is obtained				

Note 1: Radiating loop is made of 6 to 8 turns of insulated wire on a 6-inch diameter. Connect to generator terminals and place about 12 inches from radio.

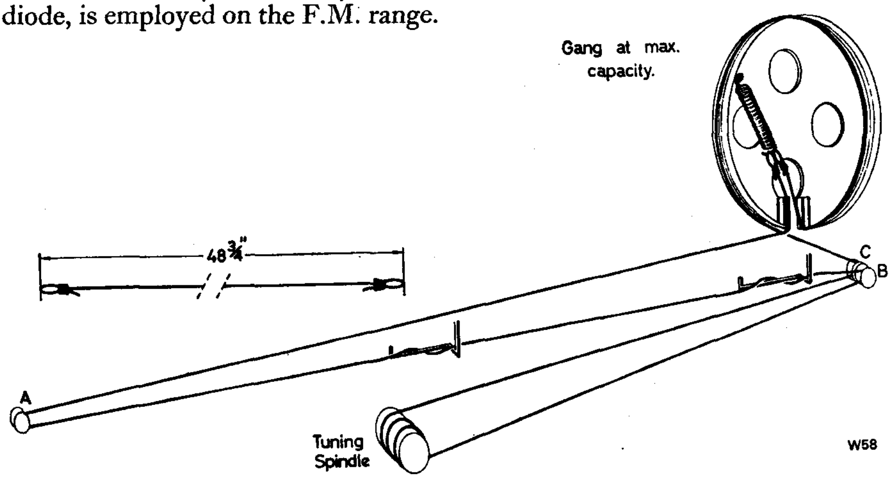
F.M. Alignment: Refer to A.M. alignment preliminary instructions. Set band switch to F.M. position.

	Signal generator		*Radio*		
Step	*Connection to radio*	*Dial setting*	*Dial setting*	*Special instructions*	*Adjust*
1	Emitter of Q2 through 0·01 Mf. cap.	10·7 Mc. ±500 kc. sweep	Tuning gang fully open	Adjust for maximum output in order given. Reduce generator output as necessary	T5A pri. T4 T3 T2
2	Same as Step 1	10·7 Mc. 30% A.M.	Tuning gang fully open	Adjust for minimum output	T5B sec.
3	Repeat Steps 1 and 2 until no further improvement is obtained				
4	Use radiating loop. (See Note 1 under A.M. alignment)	86·2 Mc. 30% F.M.	Tuning gang fully closed	Adjust for max. output	L4 F.M. osc.
5	Same as Step 4	108·8 Mc. 30% F.M.	Tuning gang fully open	Adjust for max. output	VC1C F.M. osc.
6	Same as Step 4	87 Mc. 30% F.M.	87 Mc.	Adjust for max. output	L2 (See Note below)
7	Same as Step 4	108 Mc. 30% F.M.	108 Mc.	Adjust for max. output	VC1D (see note below
8	Repeat Steps 4 and 5 until no further improvement is obtained				
9	Repeat Steps 6 and 7 until no further improvement is obtained				

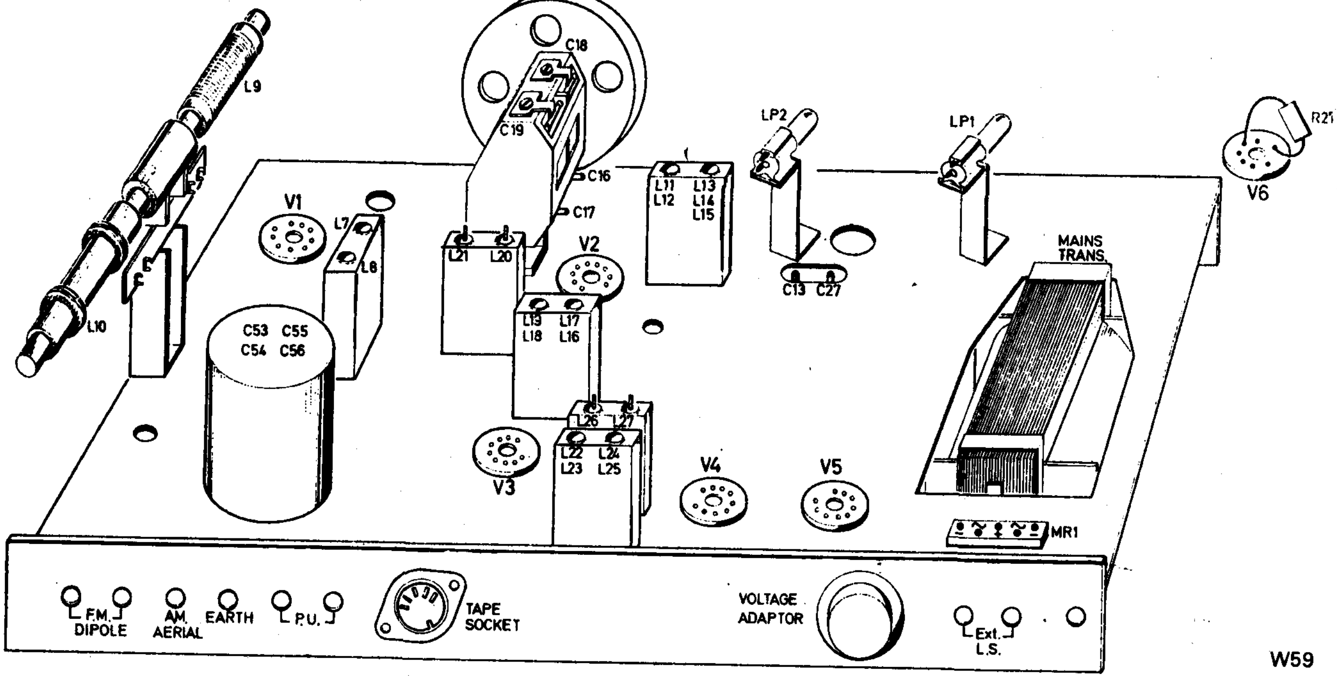
Note: When tracking is off adjust L2 and VC1D. Keep tuning correct by adjusting VC1C. Osc. frequency may vary slightly when L2 and VC1D are adjusted.

PHILIPS — Model B4S51A

General Description: A six-valve radio receiver for A.M./F.M. reception, for use on 110–127 and 220–240 volts, A.C. Mains. A.F.C., using a capacitance diode, is employed on the F.M. range.

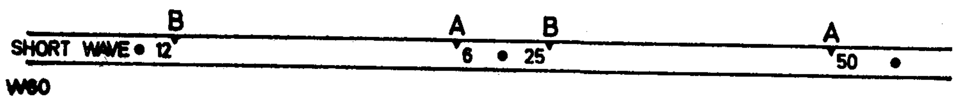


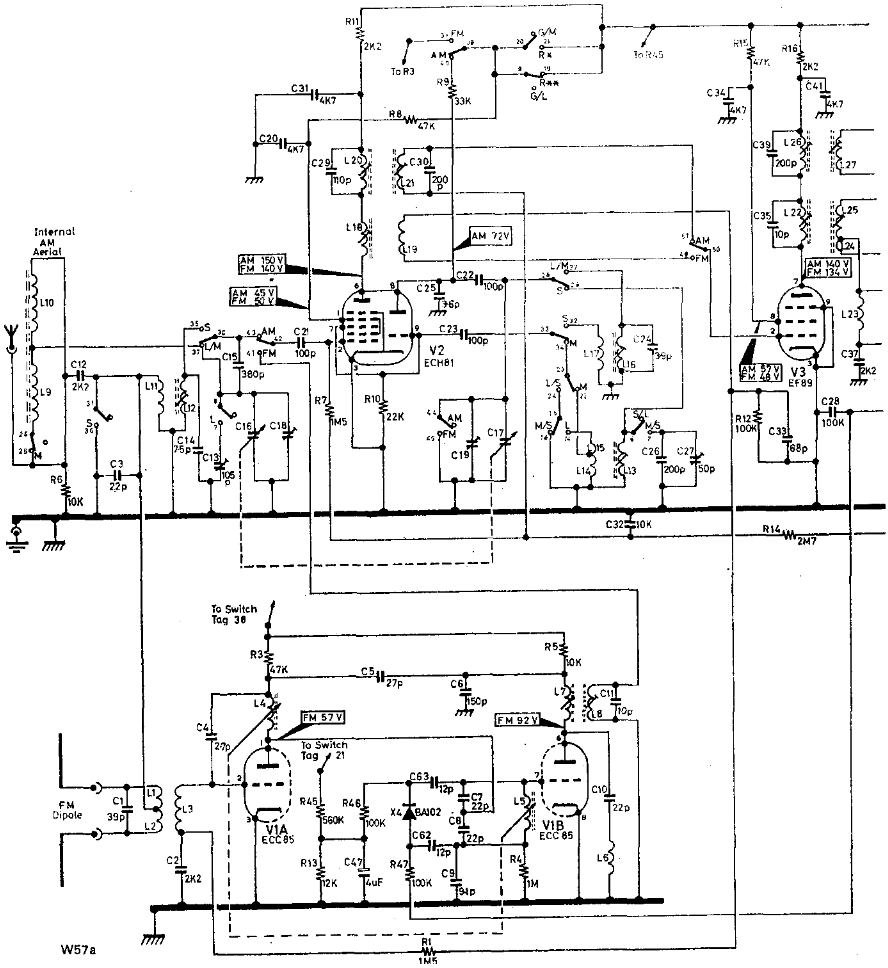
(W58) Drive Cord—Model B4S51A



Top: (W59) Chassis—Top View—Model B4S51A

Lower Right: (W60) Scale Calibration Points

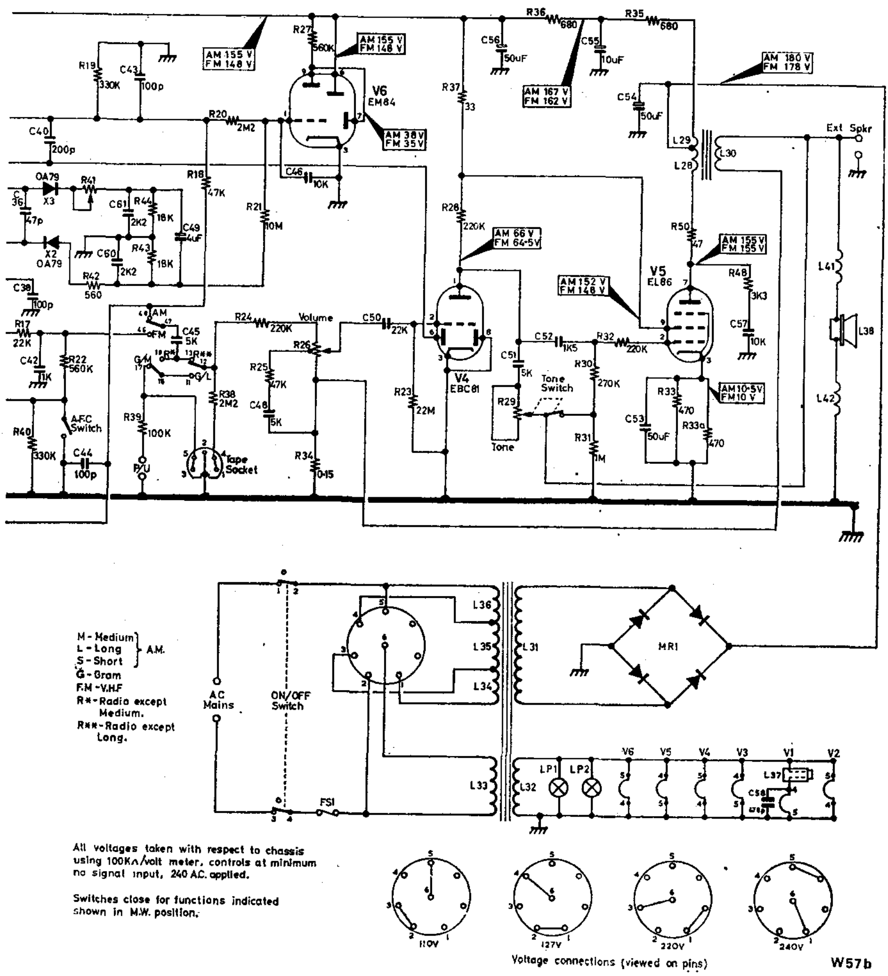




(W57a) CIRCUIT DIAGRAM—MODEL B4S51A (PART)

Alignment Table

Waveband	*Tune to*	*Gen. freq.*	*Inject signal to*	*Trim*
M.W.	Gang at max.	*468kc/s	Via 2kpF to pin 2 of V2	L27, L26 L21, L20
M.W.	†Gang at A	600kc/s	A.M. aerial socket via dummy aerial	L13, L9
M.W.	†Gang at B	1500kc/s	,, ,,	C19, C18
L.W.	†Gang at A	160kc/s	,, ,,	C27
L.W.	†Gang at B	250kc/s	,, ,,	C13, L10



(W57b) Circuit Diagram—Model B4S51A (Continued)

Alignment Table (continued):

S.W.	†Gang at A	6·1 Mc/s	,, ,,	L16
S.W.	†Gang at B	11·7 Mc/s	,, ,,	L12
V.H.F.	100 Mc/s	10·85 Mc/s	Via 47pF to pin 7 of V1b	L22, L8 L18, L7
V.H.F.	100 Mc/s	10·85 Mc/s	,, ,,	L24, L25
V.H.F.	94 Mc/s	94 Mc/s	†F.M. aerial skt	L4, L5

* Amplitude modulation at 30 percent. R41—adjust for max. A.M. suppression.
† Short-circuit C28.

Uncasing: Remove the cabinet backplate which is held by three captive screws. Withdraw the four chassis retaining bolts from underneath the cabinet. Ensure that all push-buttons are in the "up" position. Rotate the three plastic clips retaining the top of the scale to the cabinet. The chassis may now be eased from the cabinet to the extent of the loudspeaker connecting leads.

PHILIPS Model F6G50AT

General Description: This radiogram is electrically similar to Philips Model F6G42AT, information for which is given on page 291 of the 1967–68 volume.

PHILIPS Model N6501

General Description: The N6501 mains supply unit enables battery operated equipment to be operated from an A.C. mains supply. It is set to operate with a mains input of 240 V A.C. 50–60 Hz, and can be adjusted for use with 220 V, 127 V or 110 V A.C. by changing one connection of the mains lead. The unit has a stabilized output which can be switched to 7·5 V or 9 V D.C. as required. It may be used in conjunction with the various models given below.

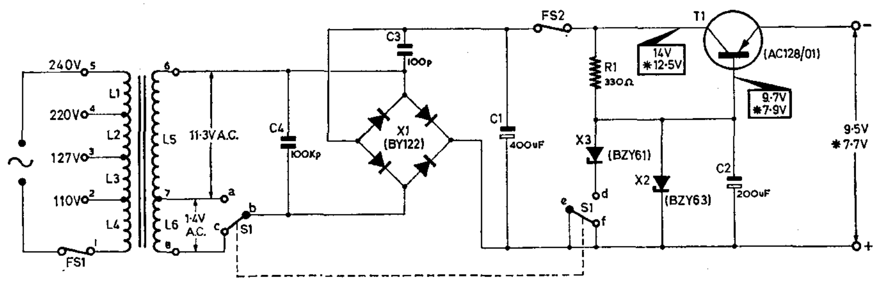
Tape Recorders: EL3300 (ST471). EL3301 (ST472). EL3301T (ST472T). EL3302 (ST473). EL3303 (ST474). EL3586. N4200. CR1621.

Record Players: AG4100. AG4127. 22GF100. 22GF227.

Tape Accessories: EL1995.

Dictation Machines: EL3583.

Portable Radios: L6X38T. 22RL673. 22RH100.



(W88) Circuit Diagram—Model N6501

Circuit Diagram Notes: 1. All voltages (unless otherwise indicated) measured with respect to positive output terminal, using a 100,000 ohms per volt meter, and with a 100 Ω load across output. 2. S1 is shown in 9 V positions. 3. The asterisks indicate S1 in 7·5 V position.

Note: To enable the unit to be operated in conjunction with models other than those given, it can be modified to give a 6 V D.C. output in the following way: Remove X3 and replace it with Zener diode BZY88/C6V2. Change the voltage indicated on the baseplate from 7·5 V to 6 V.

Caution: To prevent overloading of T1 (due to the increased voltage drop across it) when the 6 V modification is carried out, the current supplied by the unit in the 6 V position must not exceed 150 mA.

PHILIPS Model 13RF660AT

General Description: This radiogram is electrically similar to Philips Model F5G53AT, information for which is given on page 320 of the 1968–69 volume.

PHILIPS Model 13RF760AT

General Description: This radiogram is electrically similar to Philips Model F6G42AT, information for which is given on page 291 of the 1967–68 volume.

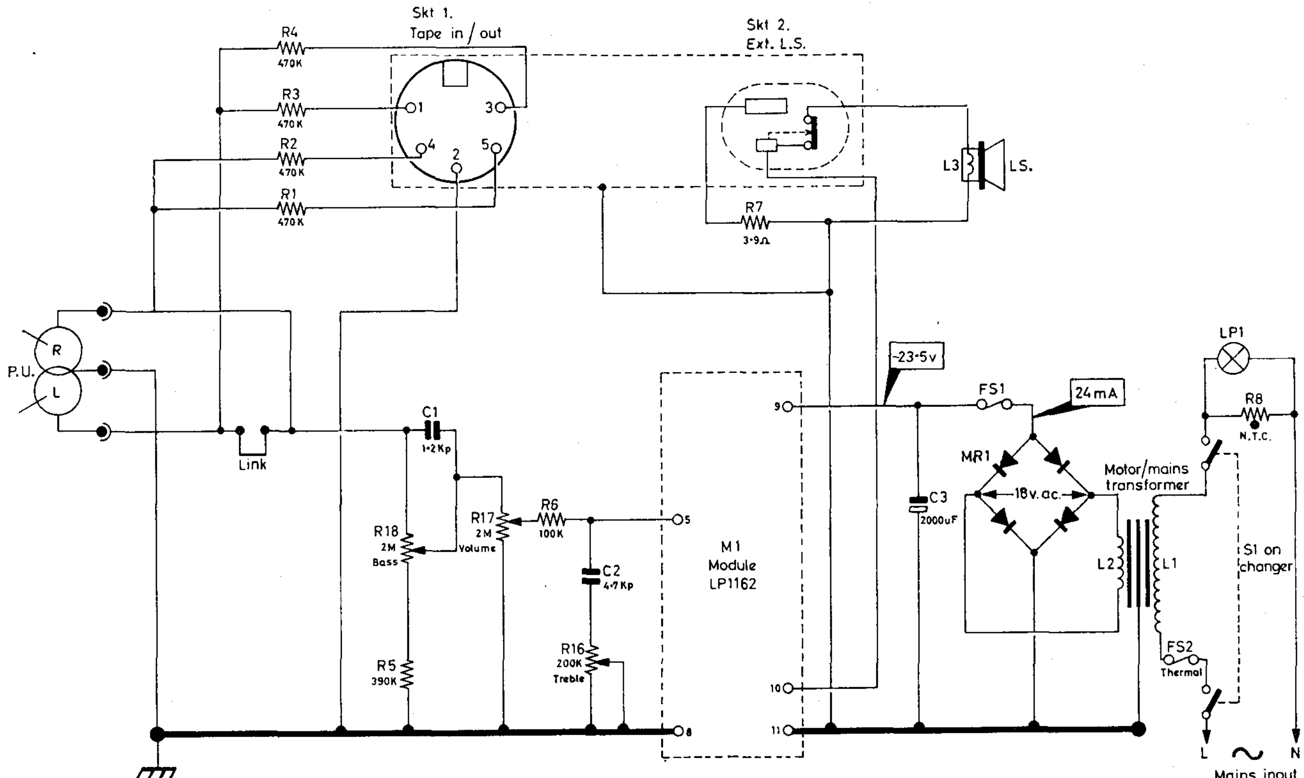
PHILIPS Model 13GF812

General Description: Mains-powered portable transistor record player. The compact 4 W amplifier module is switched on by the "start" lever on the autochanger, which is a 4-speed mono/stereo type GC350. The motor has an extra winding to supply power for the amplifier. The 5-pin DIN socket can be used for making tape recordings, or for the amplification of an audio signal. An extension speaker socket allows for the connection of an external loudspeaker of from 8 to 16 Ω impedance.

Warning: The output transistors will be damaged if the speaker is short-circuited, or an external speaker of less than 8 Ω impedance is used.

Note: The motor/mains transformer is fitted with a thermal fuse in the primary winding. If overheating actuates this fuse, it cannot be reset; the motor/mains transformer must be replaced.

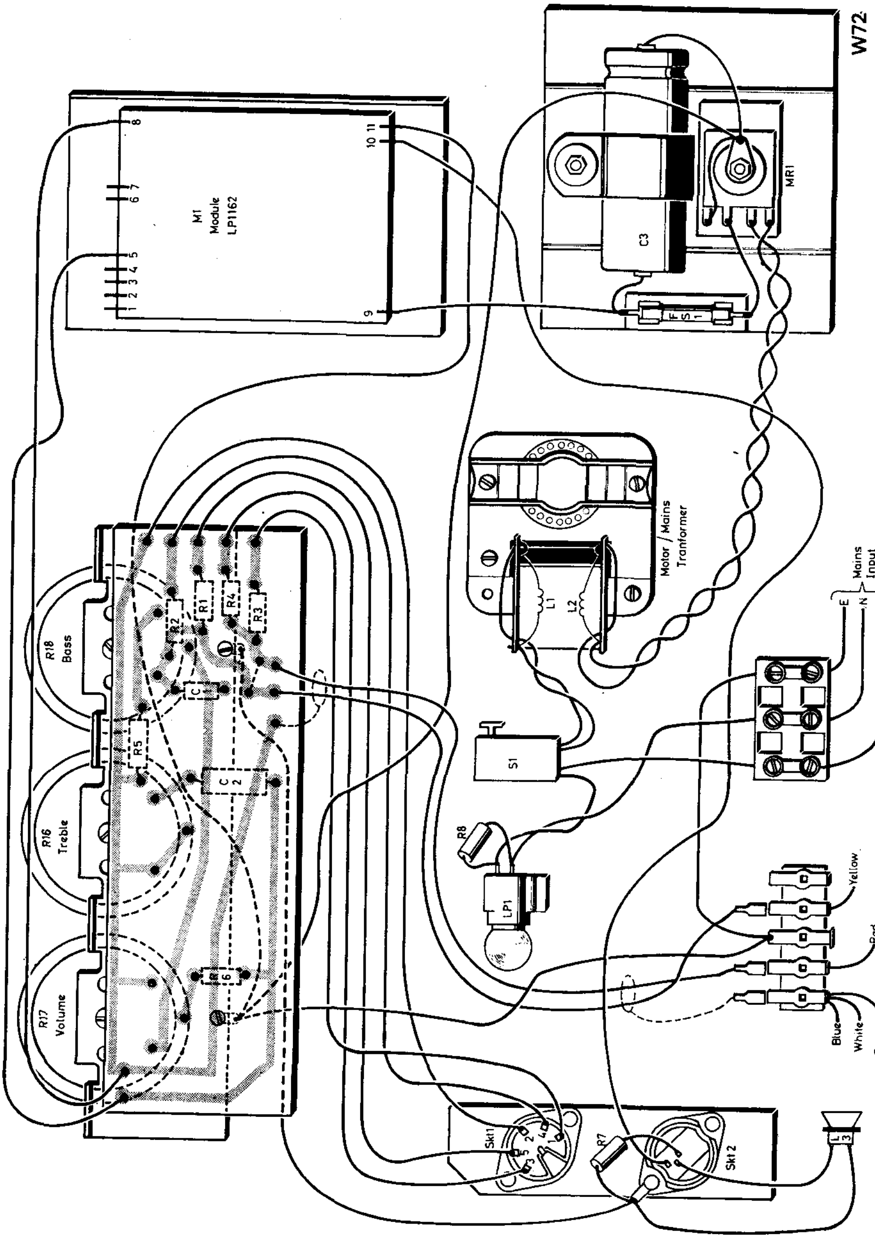
Uncasing: Disconnect from supply and remove fibreboard ventilation panel held by three screws. Undo 2 screws securing control panel and lift off for access to powerpack and amplifier. To remove motor board, take out six fixing screws, lift up rear and left-hand side and ease upwards and out, rear left-hand corner first.



W71

Circuit Diagram Notes: 1. All voltages taken with respect to chassis, using a 100,000 ohms per volt meter, volume control at minimum, main's input 240V A.C. 50Hz. 2. D.C. resistance of coils: L1 (330Ω), L2 (3Ω) and L3 (11Ω). 3. Impedance of loudspeaker, 12Ω.

(W71) CIRCUIT DIAGRAM—MODEL 13GF812



(W72) Interconnections Diagram—Model 13GF812

PHILIPS Model 13GF813

General Description: Mains-powered portable record player employing a five-transistor, two-watt amplifier with separate bass and treble controls. The four-speed autochanger is a BSRUA25 except for the motor winding which supplies power for the amplifier. A 5-pin DIN socket provides the facility for making tape recordings from disc records, or for amplifying an audio signal. Loudspeaker: elliptical, 25 Ω.

Uncasing: Disconnect from supply and take off the fibreboard ventilation panel secured with 2 screws. To remove front grille, remove the screw inside at bottom centre and two outside screws (one at each side). To remove changer from motorboard, turn the transit screws fully clockwise; reach under motorboard and turn clip on near right-hand transit screw into line with the screw. Lift the right-hand side clear and pull the changer diagonally away from the rear left-hand corner to clear the left-hand side mounting slot.

Note: The motor/mains transformer is fitted with a thermal fuse in the primary winding. If overheating actuates this fuse, it cannot be reset and the motor/mains transformer must be replaced.

Circuit Diagram: See opposite page.

PHILIPS Model 13RB262

General Description: A six transistor, two waveband, mains operated radio employing a micro-technique chassis.

Wavebands: M.W.: 185–571 metres. L.W.: 1175–2000 metres.

Alignment: I.F. 470kHz (L10, L8, L6); Osc. L.W. 148kHz (L4); Osc. M.W. 1630kHz (C27); Aerial L.W. 190kHz (L3/14); Aerial M.W. 525kHz (L1/L2). Apply 1300kHz, tune to this frequency and adjust C28 for max.

Removing the Cabinet Rear: Place receiver face downwards on a soft protective surface and remove the two retaining screws from rear of cabinet. Ease mains lead through cabinet rear, which can be lifted clear. The component side of the printed panel and the power supply chassis are then readily accessible.

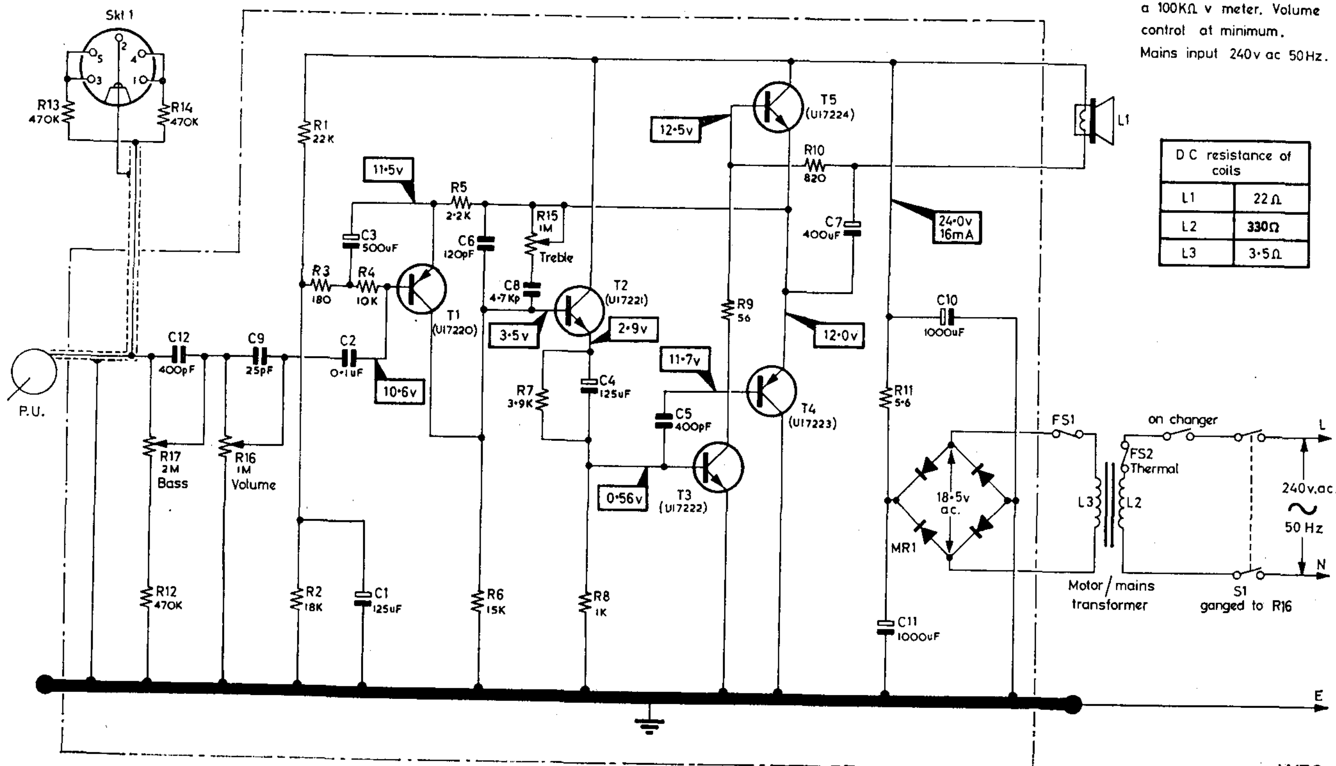
Releasing the Printed Panel: Remove the three panel securing screws, two at the top adjacent to the ferrite rod and one at the bottom on the paxolin panel. The complete panel assembly may now be lifted clear of front moulding, giving access to print side of panel and drive cord assembly.

Releasing the Power Supply Chassis: Remove the three retaining screws, one from top next to volume control and two from bottom adjacent to mains transformer. The power supply chassis may now be lifted clear of the front moulding.

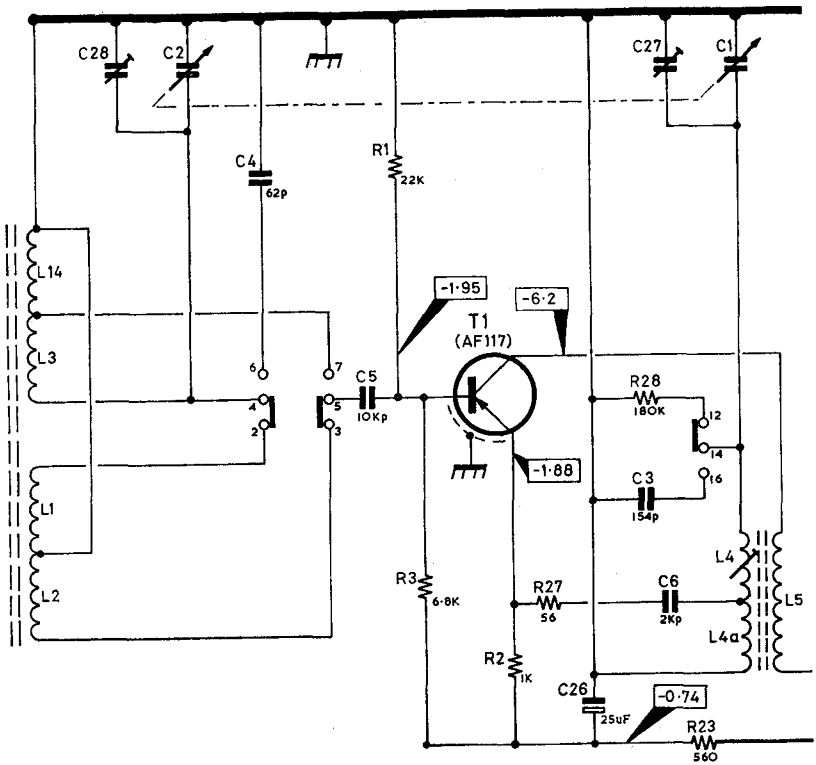
Circuit Diagram: See pages 604–606

All voltages taken with respect to chassis using a 100KΩ v meter. Volume control at minimum.
Mains input 240v ac 50Hz.

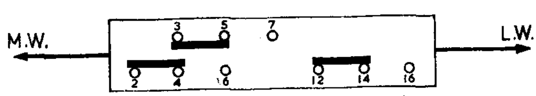
D C resistance of coils	
L1	22Ω
L2	330Ω
L3	3·5Ω



(W73) Circuit Diagram—Model 13GF813



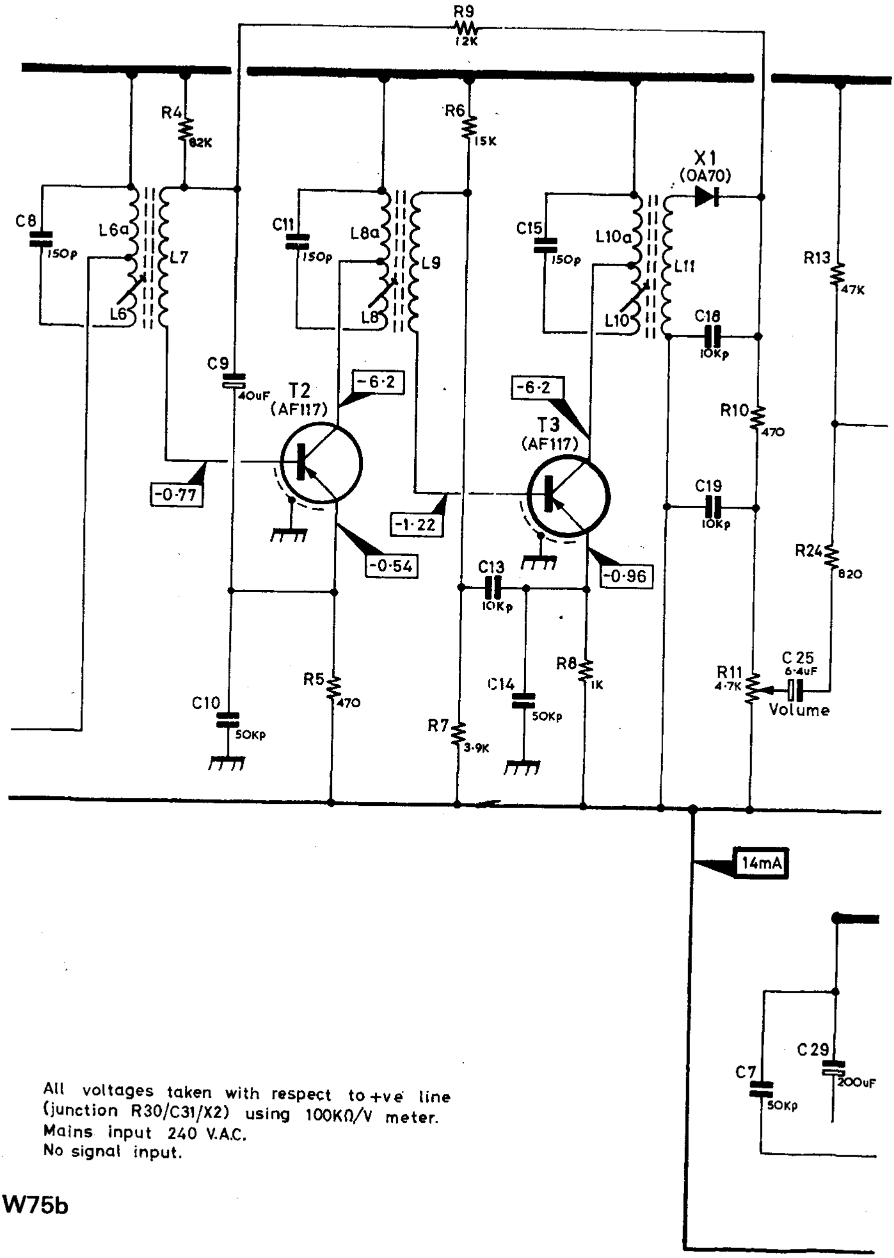
COIL RESISTANCES			
L1	4Ω	L9	<1Ω
L2	<1Ω	L10	9Ω
L3	19Ω	L10a	3·3Ω
L4	4·8Ω	L11	1·8Ω
L4a	<1Ω	L12	8Ω
L5	<1Ω	L14	3Ω
L6	8Ω	L15	60Ω
L6a	2·1Ω	L16	60Ω
L7	<1Ω	L17	250Ω
L8	7·5Ω	L18	1500Ω
L8a	2·4Ω	L19	34Ω



Wavechange switch shown in M.W. position

W75a

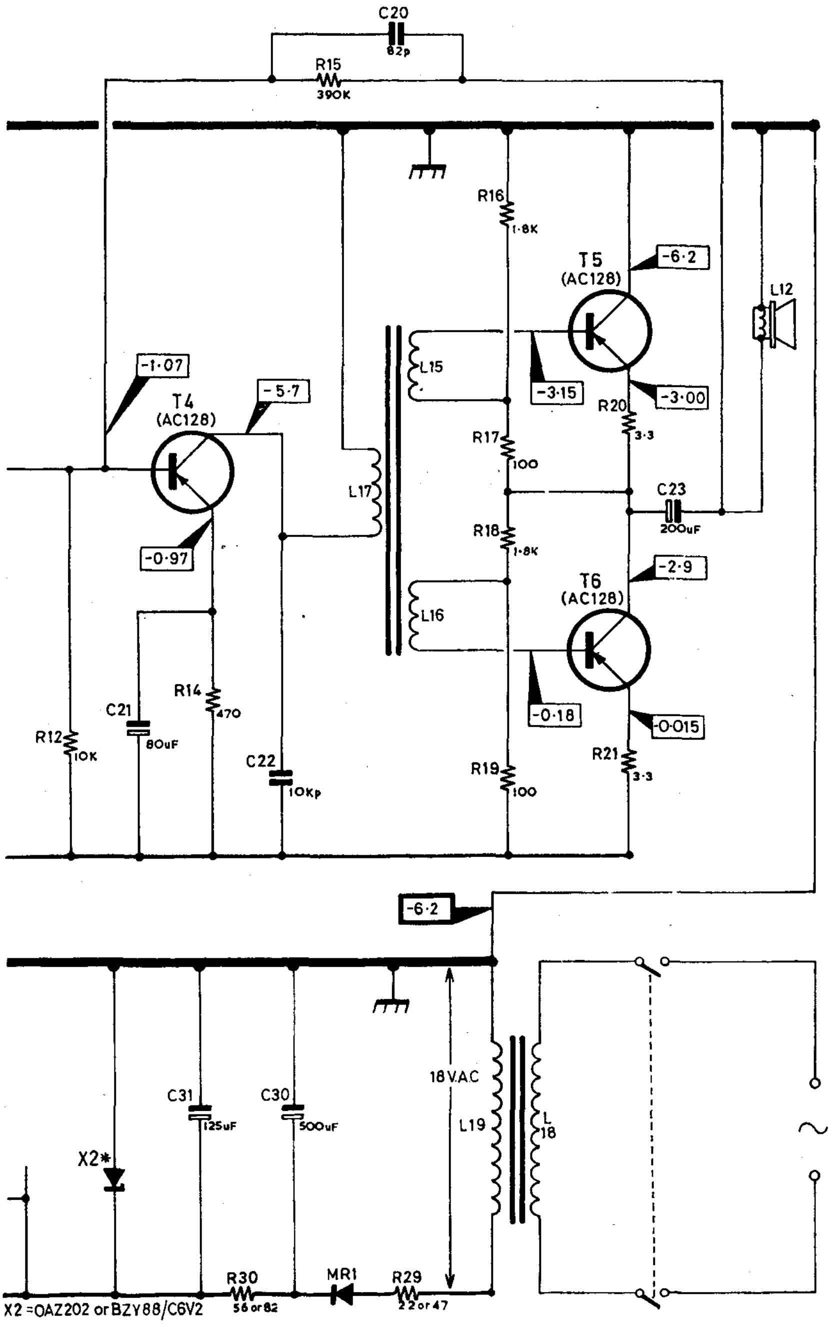
(W75a) Circuit Diagram—Model 13RB262 (Part)



All voltages taken with respect to +ve line (junction R30/C31/X2) using 100KΩ/V meter.
Mains input 240 V.A.C.
No signal input.

W75b

(W75b) Circuit Diagram—Model 13RB262 (Part)



W75c (W75c) CIRCUIT DIAGRAM—MODEL 13RB262 (CONTINUED)

Releasing the Loudspeaker: Care should be taken not to break the moulded lugs. Carefully ease off the four spire clips and rubber washers. The loudspeaker may now be lifted from the front moulding.*

Releasing the Loudspeaker Grille: Remove printed panel, power supply chassis and loudspeaker as described above. Carefully remove the four spire clips and rubber washers from the moulded lugs. The loudspeaker grille will then drop from the front moulding.*

Releasing the Station Scale: Remove printed panel as described above. Carefully remove the two spire clips and rubber washers from the clear moulding lugs of the station scale backplate. Ease scale from front moulding and out from under loudspeaker grille.

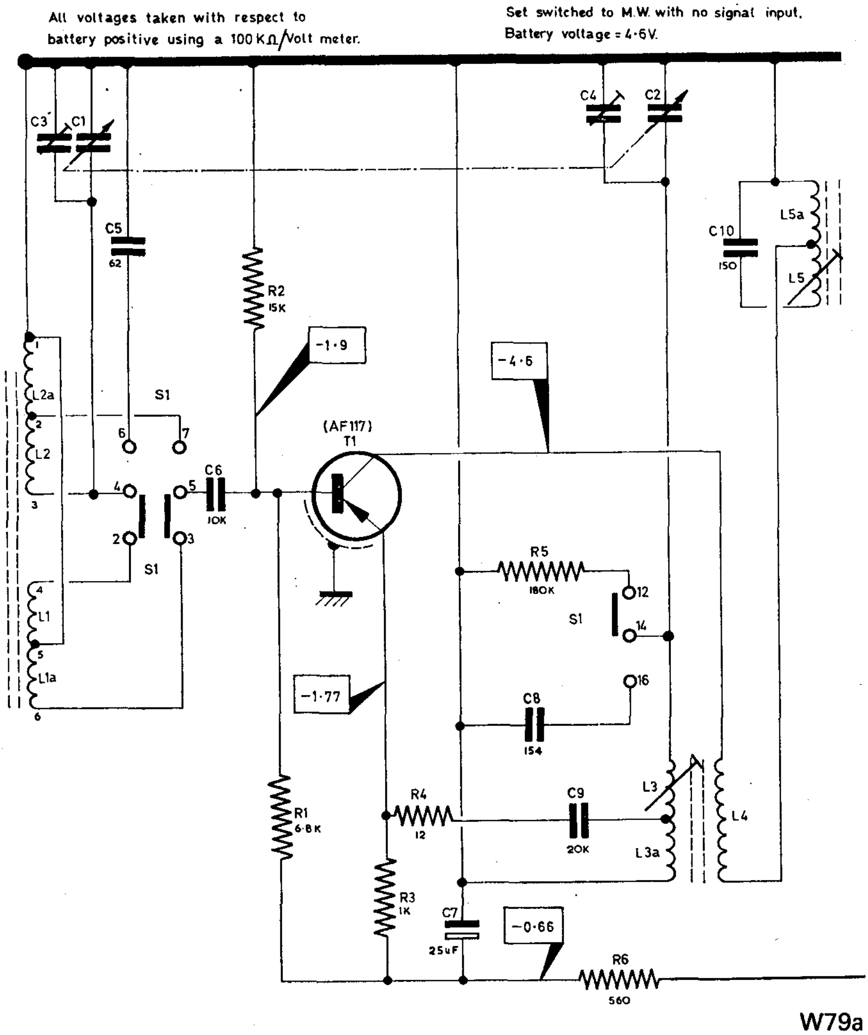
Replacing Drive Cord: A pair of tweezers or long-nosed pliers will greatly assist in this operation. 1. Detach the old cord and pointer, and make up a new cord $14\frac{3}{8}$ in. long with a small loop at each end. 2. With the chassis viewed from the print side of the panel, and the ferrite rod assembly to the front, turn the gang to minimum capacity (drive drum fully anticlockwise). 3. Anchor cord round post of drive drum and under one leg of tension spring. 4. Lead cord out through drum aperture, pass cord anticlockwise round outside of drum, up to tuning spindle, and wind on $2\frac{1}{2}$ turns clockwise (winding from bottom to top). 5. Take cord up to and clockwise round support pillar, anticlockwise round drive drum, and back through aperture in drum rim. 6. Compress the tension spring, and anchor cord loop on to the "V" in the other leg of the tension spring. 7. Turn the drum to its fully clockwise position (tuning knob fully anticlockwise). Attach the pointer to the drive cord and align it with the notch in the scale backing plate, adjacent to the tuning knob.

* *Note:* When refitting the loudspeaker, grille or station scale, ensure that the rubber washers are also replaced.

PHILIPS — Model 13RL180

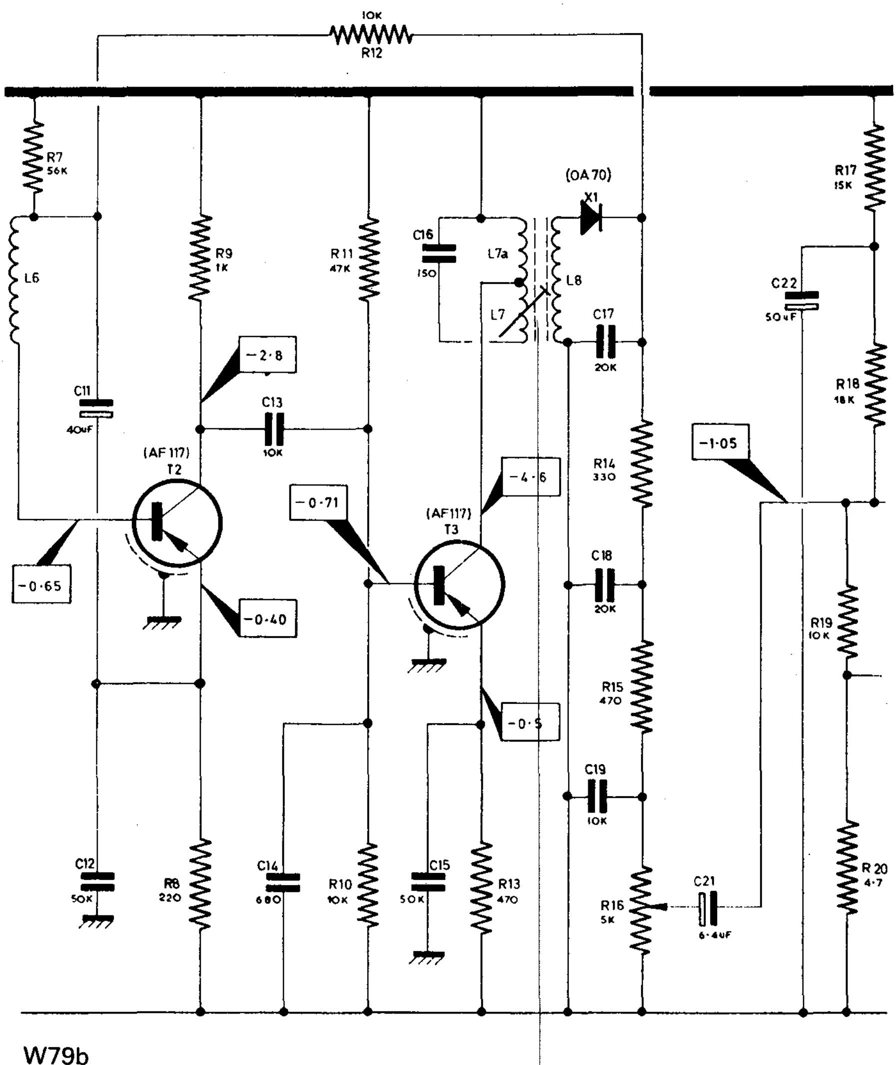
General Description: Battery operated portable radio receiver with a power output of 150mW. Batteries, 3 off U7. Socket for earphone. Loudspeaker: round, 8 Ω.

Dismantling: Loosen screw in end-plate and hinge back the rear case section. Remove the three panel securing screws, one at top adjacent to ferroceptor aerial rod and one either end of battery compartment, then free earphone socket by releasing its fixing nut. The panel may now be lifted out, to extent of loudspeaker connecting leads, giving access to print side of panel



(W79a) Circuit Diagram—Model 13RL180 (Part)

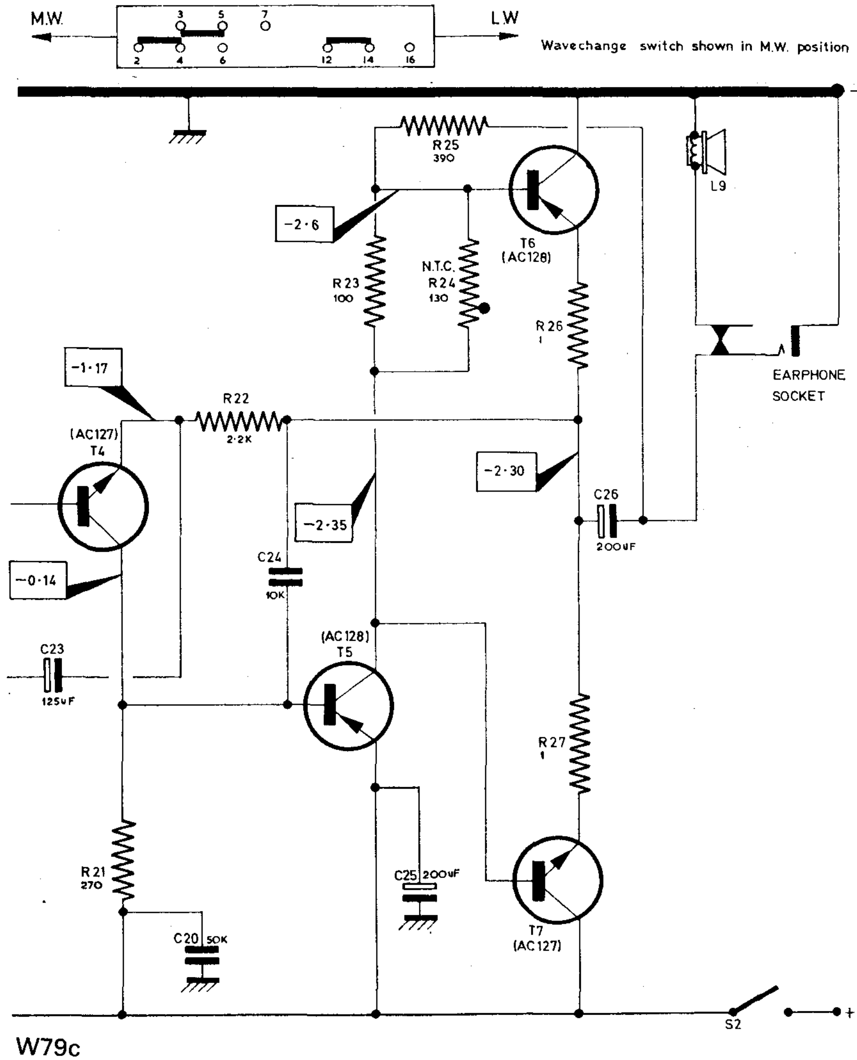
and drive cord assembly. To withdraw the chassis assembly completely, the loudspeaker connecting leads may be unsoldered or, alternatively, the assembly complete with loudspeaker may be withdrawn from the case by releasing the



(W79b) Circuit Diagram—Model 13RL180 (Part)

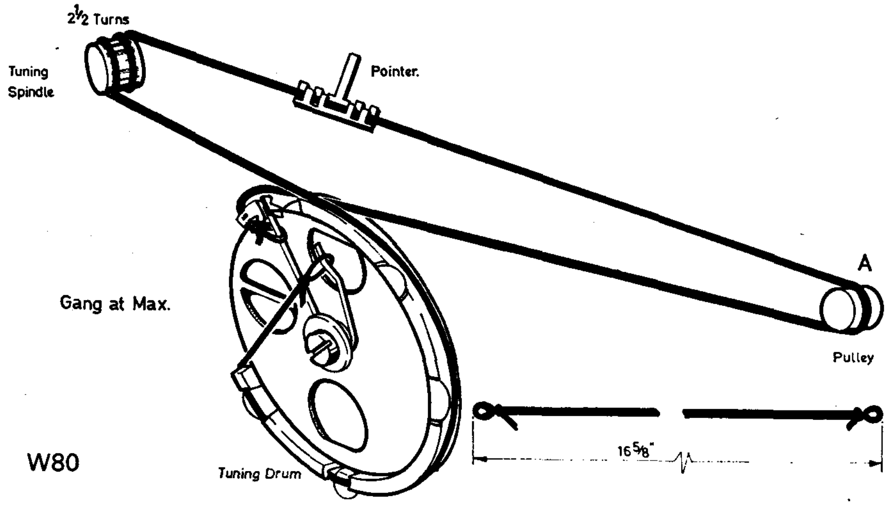
two loudspeaker retaining brackets (two screws). Re-assemble in the reverse order.

Wavebands: M.W. 185–571 metres. L.W.: 1175–2000 metres.



(W79c) Circuit Diagram—Model 13RL180 (Continued)

Alignment: I.F. 470kHz. (Remove screening can of L7/8 and trim for max. Refit can to L7/8 and trim L5/6); Osc. L.W. 148kHz (L3/4); Osc. M.W. 1630kHz (C4); Aerial. L.W. 190kHz (L2); Aerial. M.W. 525kHz (L1); Apply 1300kHz, tune to this frequency and tune C3 for max.

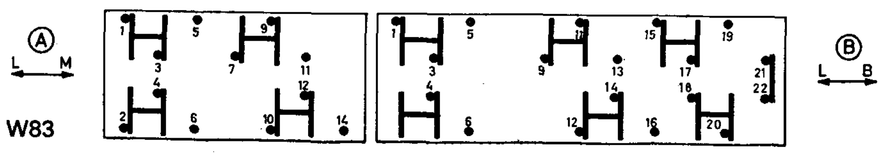


(W80) Drive Cord—Model 13RL180

PHILIPS Model 13RL269

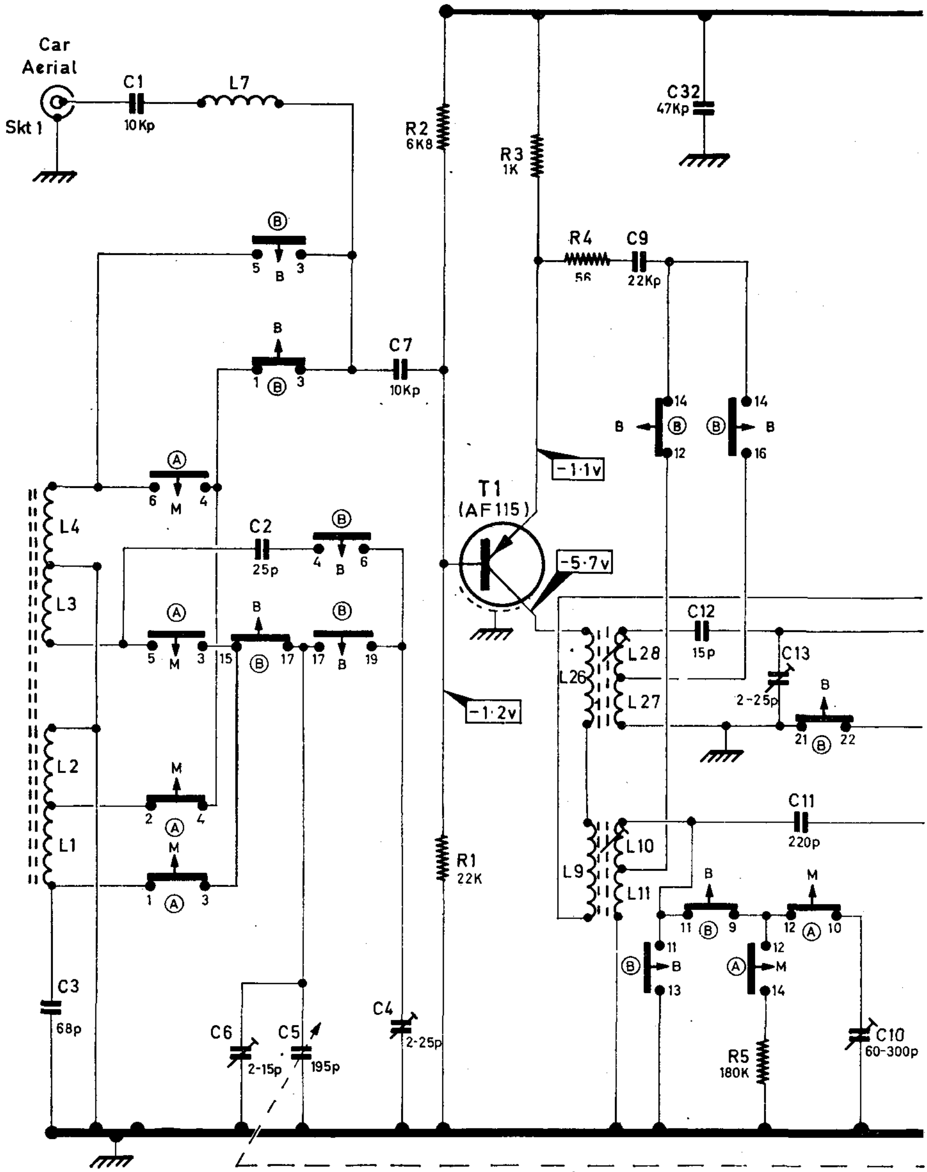
General Description: Battery operated portable receiver with an average power output of 200 mW. Sockets are provided for car aerial and earphone. Battery, 4 off 1·5 V. Loudspeaker: elliptical, 8 Ω.

Wavebands: L.W.: 1175–2000 metres. M.W.: 195–550 metres. B.W.: 183–214 metres.



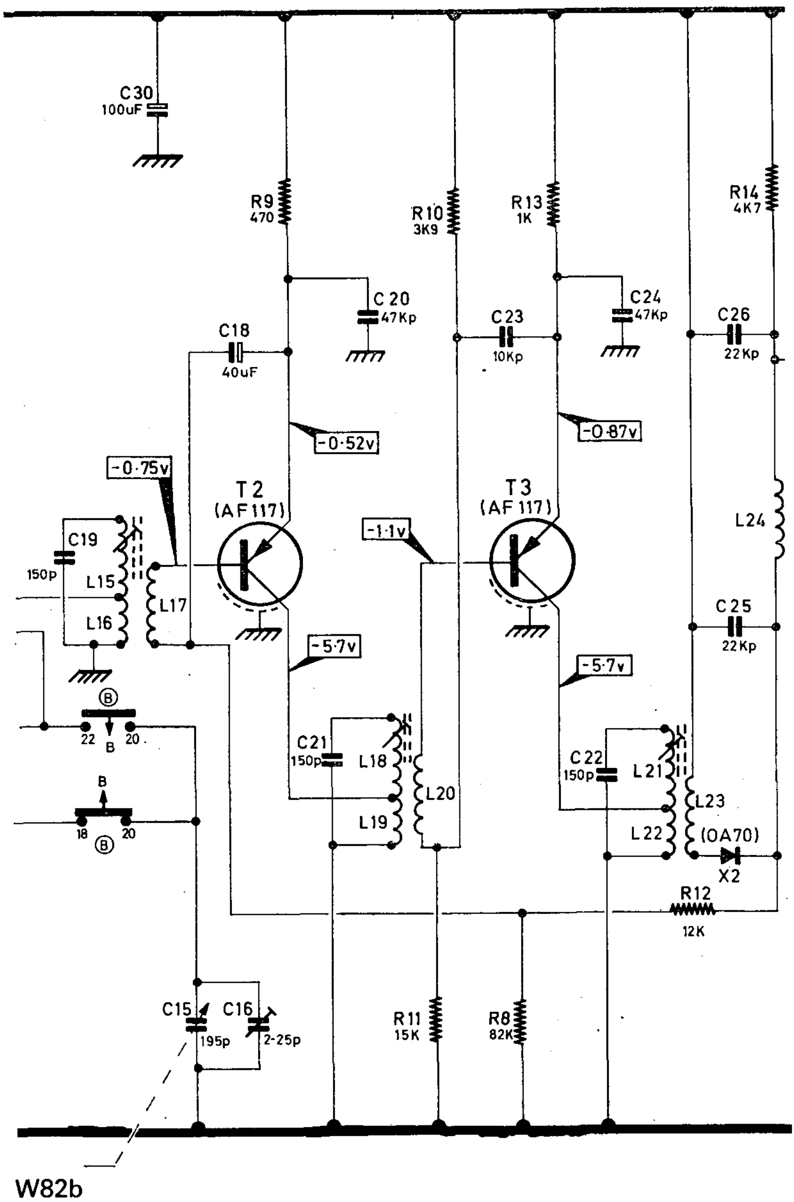
(W83) Wavechange Switch—Model 13RL269. Note that switches "A" and "B" are shown in L.W. position. Switches operate only for functions indicated

Dismantling: Remove the spring loaded battery compartment and lay the receiver face downwards on a soft protective surface. Release two retaining screws and lift off cabinet rear. Remove screw situated in volume control compartment and screw adjacent to wavechange switch assembly. The chassis can now be lifted from cabinet front, captive only by loudspeaker and earphone/aerial connecting leads, which may now be unsoldered.

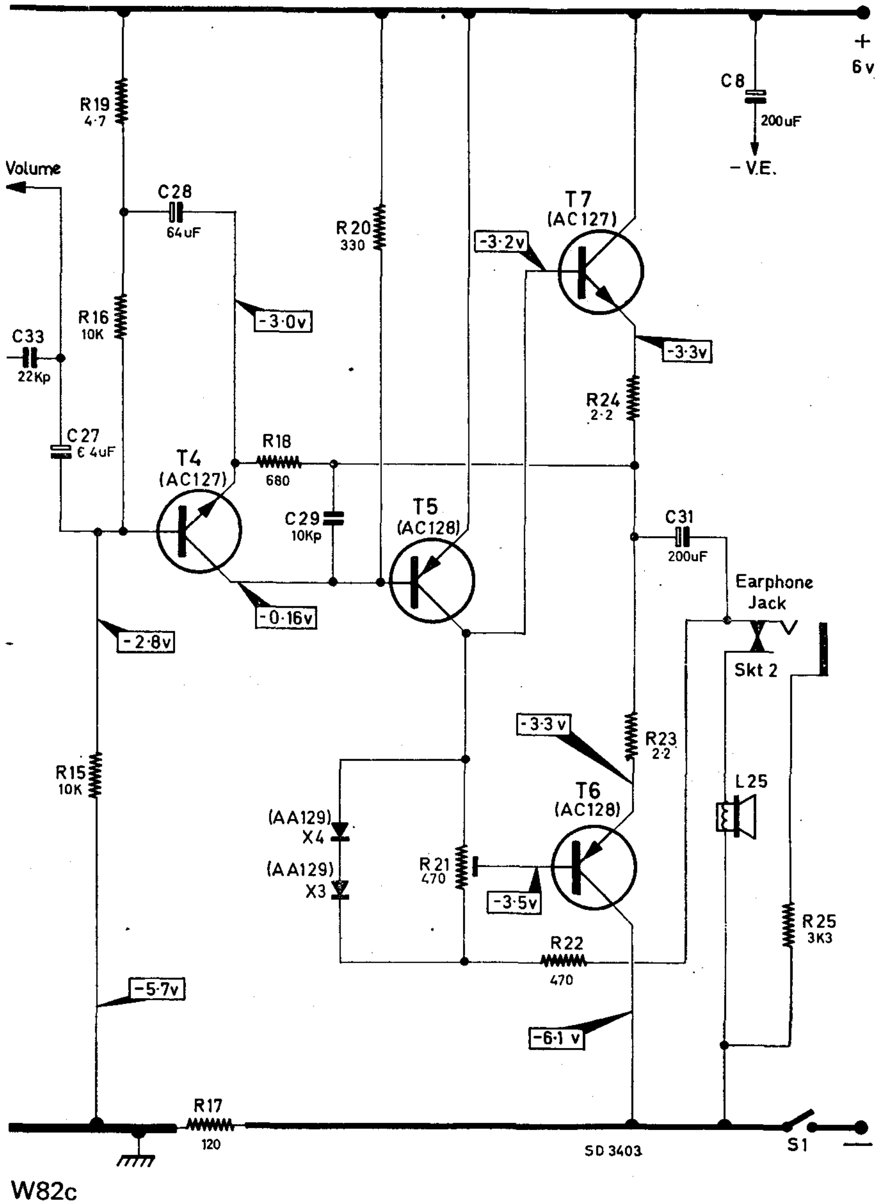


W82a

(W82a) Circuit Diagram—Model 13RL269 (Part)



(W82b) Circuit Diagram—Model 13RL269 (Part)

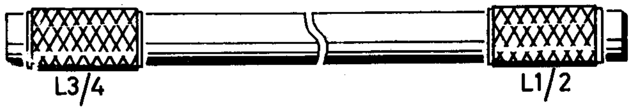


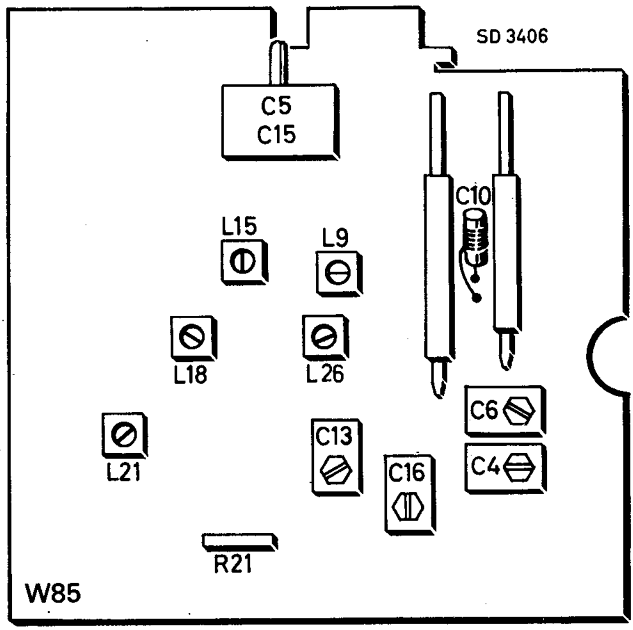
(W82c) Circuit Diagram—Model 13RL269 (Continued)

Alignment Instructions: Output should be observed on an output meter set for 8 Ω load impedance. Alternatively, an A.C. voltmeter (2·5 V range) with an 8 Ω resistor in parallel with it may be used. The level should be held at 0·75 V. In either case the loudspeaker should be disconnected, and the volume control should be set for maximum output.

Alignment Table

Switch	*Gang*	*Inject*	*Sig. Gen.*	*Adjust*
		I.F.		
M.W.	Min.	To Ae side of C7 via 0·47 μF cap.	470 kHz	L21 Max.
M.W.	Min.		472 kHz	L18 Max.
M.W.	Min.		468 kHz	L15 Max.
		M.W. Osc.		
M.W.	Max.	As above	540 kHz	L9 Max.
M.W.	Min.	As above	1545 kHz	C16 Max.
		Repeat as necessary		
		L.W. Osc.		
L.W.	Max.	As above	148 kHz	C10 Max.
		B.W. Osc.		
B.W.	Max.	As above	1395 kHz	L26 Max.
B.W.	Min.	As above	1645 kHz	C13 Max.
		Repeat as necessary		
		M.W. Ae.		
M.W.	600 kHz	Via coupling loop	600 kHz	L3/4 Max.
M.W.	1500 kHz		1500 kHz	C6 Max.
		Repeat as necessary		
		L.W. Ae.		
L.W.	190 kHz	Via coupling loop	190 kHz	L1/2 Max.
		B.W. Ae.		
B.W.	1645 kHz	Via coupling loop	1645 kHz	C4 Max.



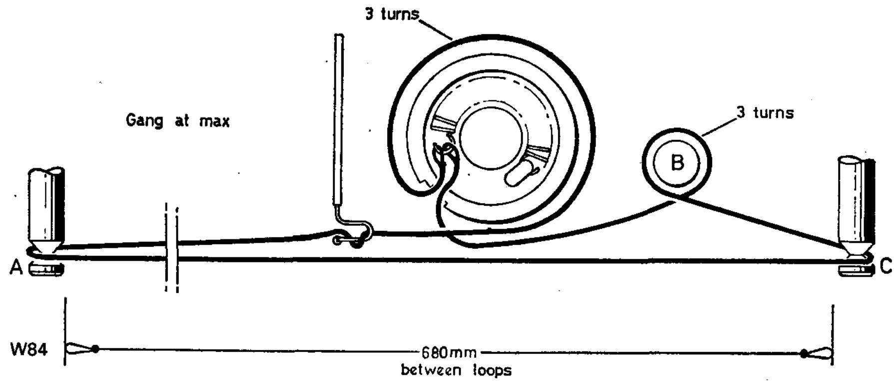


(W85) Trim Plan—Model 13RL269

D.C. Resistances of Coils $> 1\,\Omega$

Coil No.	*Ohms*	*Coil No.*	*Ohms*
L1	6·4	L19	2·4
L3	2·3	L21	3·5
L7	2·5	L22	9·5
L10	5·0	L23	1·9
L15	8·4	L24	260
L16	2·4	L25	8·0
L18	7·9	L28	6·1

Adjustment of R21: This resistor controls the quiescent current drawn by T6/T7, and since the A.F. amplifier stages of the receiver are D.C. coupled it is advisable to check, and if necessary adjust, this current value after any servicing has been carried out on the A.F. amplifier stages. To measure the current, remove the shorting link and insert a 0–10 mA meter. Turn the volume control to minimum and adjust R21 for a meter reading of 3 mA. Disconnect the meter and replace the shorting link.



(W84) Drive Cord—Phillips Model 13RL269

PYE Model 1377

General Description: This model is similar to Model 1369 described on page 340 of the 1968–69 volume.

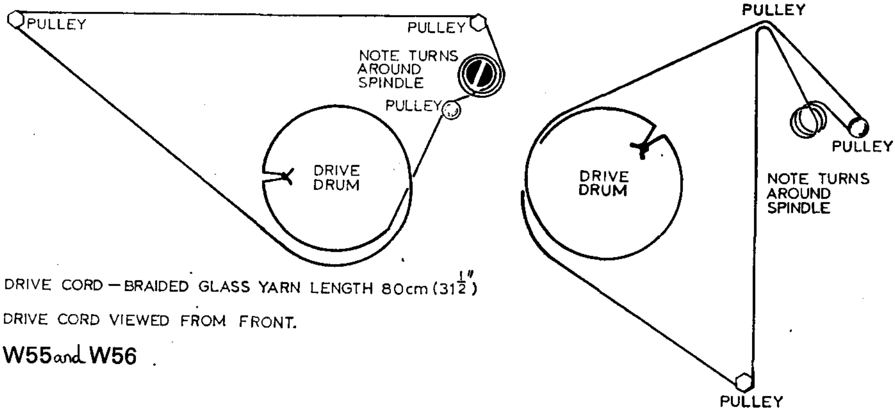
PYE Model 1380

General Description: This model is similar to Model 1366 described on page 316 of the 1967–68 volume.

PYE Model 1374

General Description: A ten-transistor F.M./A.M. portable receiver, with earphone socket. Battery $4\frac{1}{2}$ V ($3 \times 1\frac{1}{2}$), U11 or equivalent. Quiescent current 9mA approx.

Wavebands: L.W. 858–2000 metres. M.W. 187–566 metres. V.H.F./F.M 88–108 MHz.

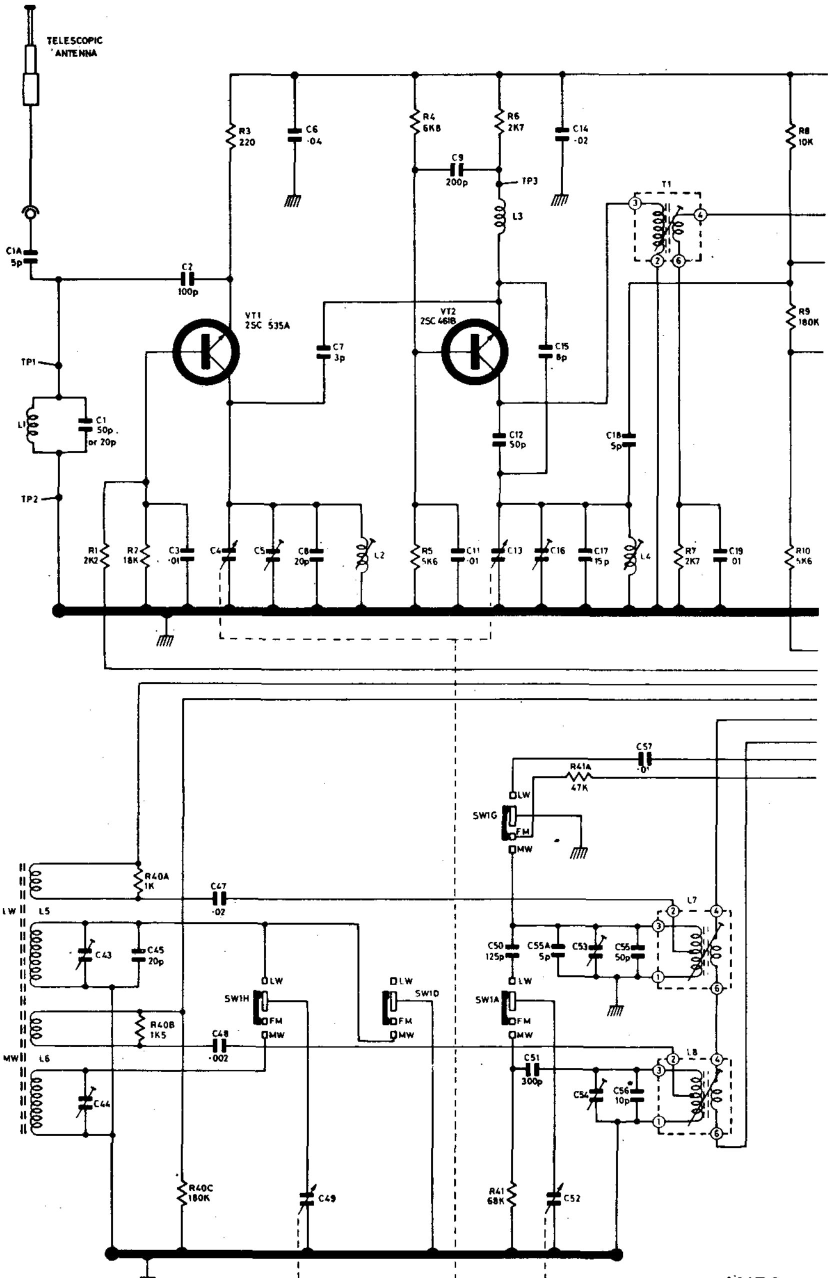


Left: (W55) Drive Cord 1; *Right:* (W56) Drive Cord 2—Model 1374

F.M. Alignment Table

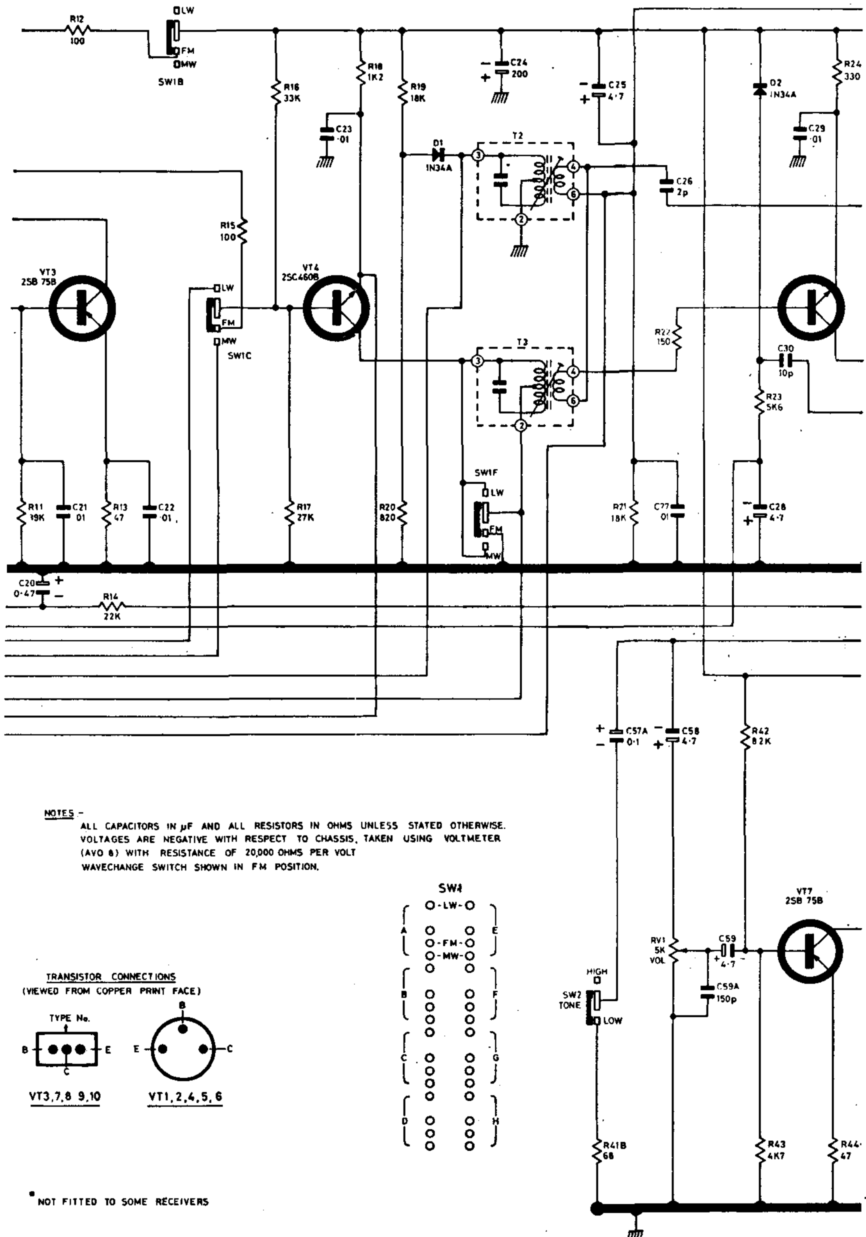
Apply signal as below:	Set receiver controls to:	Adjust in order for maximum output:
1. 10·7 MHz ±22·5 kHz deviation, to TP1	Volume control at maximum. Tone in "high" position. F.M. band. Point of no interference.	Cores of T8, T7, T5, T3 and T1.
2. As (1), but 109 MHz.	F.M. band. High frequency end.	Trimmer C16.
3. As (1), but 87 MHz.	F.M. band. Low frequency end.	Spacing of L4.
4. Repeat steps (2) and (3).		
5. As (1), but 106 MHz.	Tune to signal.	Trimmer C5.
6. As (1), but 90 MHz.	Tune to signal.	Spacing of L2.
7. Repeat steps (5) and (6).		

Notes: For step (1) D.C. probe of vacuum tube voltmeter should be connected to RV1. For steps (2) to (7) output meter (Avo 8 or similar) connected across loudspeaker terminals.



W53a

(W53a) Circuit Diagram—Model 1374 (Part)

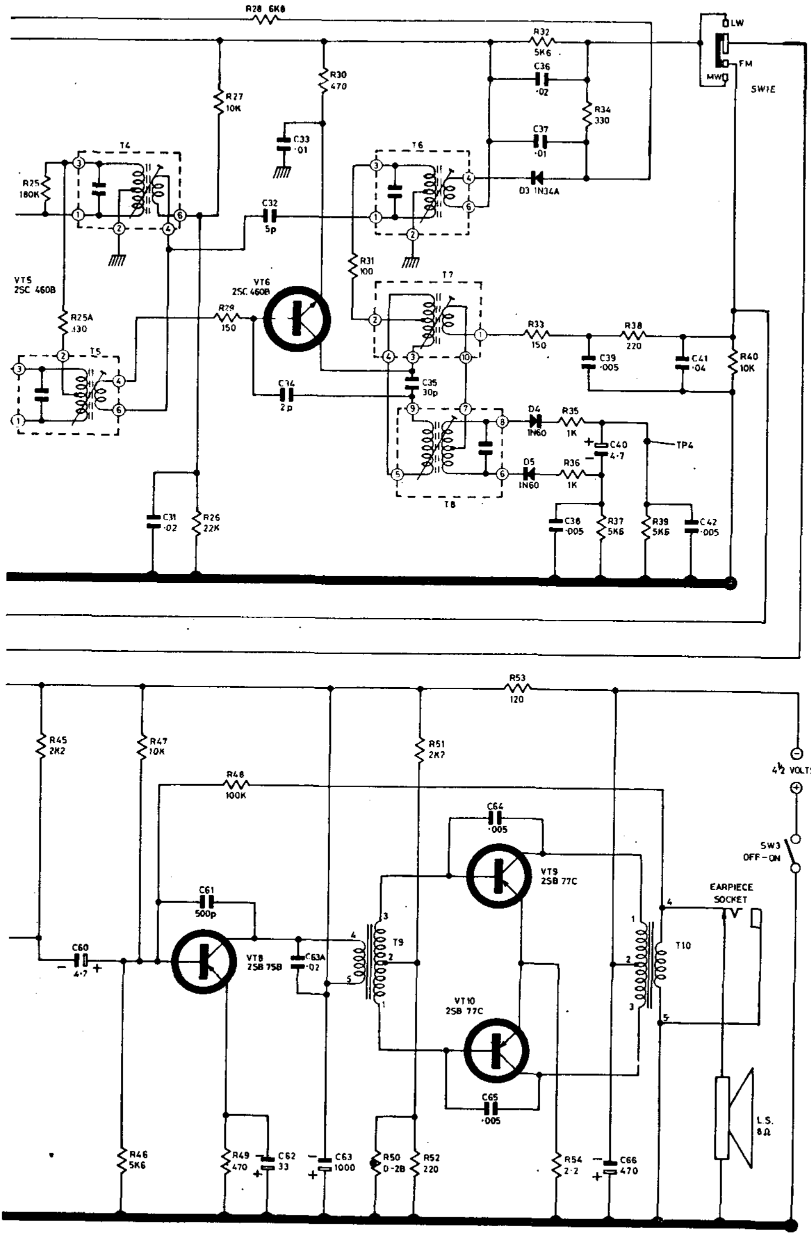


NOTES –
ALL CAPACITORS IN μF AND ALL RESISTORS IN OHMS UNLESS STATED OTHERWISE.
VOLTAGES ARE NEGATIVE WITH RESPECT TO CHASSIS, TAKEN USING VOLTMETER (AVO 8) WITH RESISTANCE OF 20,000 OHMS PER VOLT
WAVECHANGE SWITCH SHOWN IN FM POSITION.

* NOT FITTED TO SOME RECEIVERS

W53b

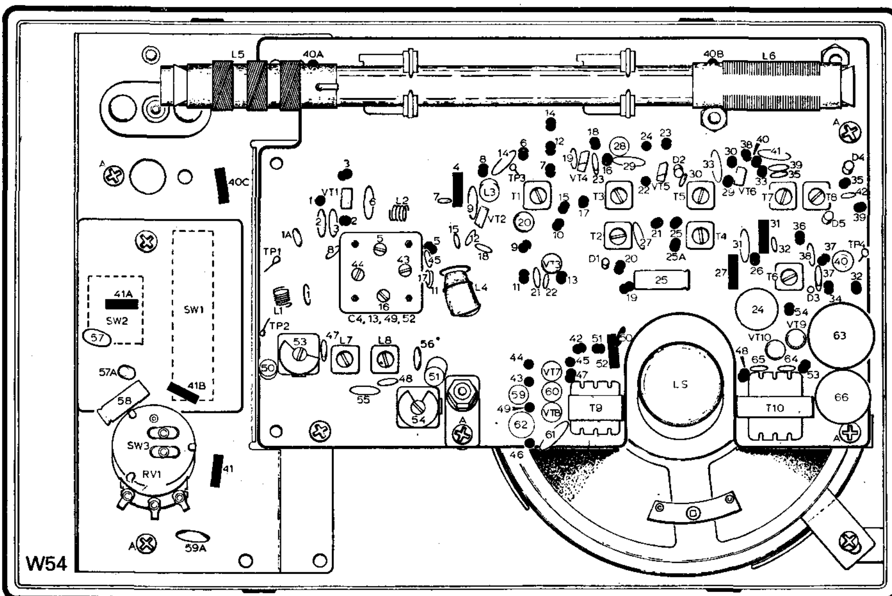
(W53b) Circuit Diagram—Model 1374 (Part)



W53c

(W53c) Circuit Diagram—Model 1374 (Continued)

Chassis Removal: Remove single screw in centre of back cover. Next, unsolder leads to battery holder and (if required) loudspeaker leads. Prise out earphone socket and unplug F.M. aerial lead. Next, remove five screws securing chassis.



COMPONENTS ON COPPER SIDE — C26, 34, 36, 55A, 63A, R28
NOTE :- ALL RESISTORS SHOWN IN BLACK

*C56 NOT FITTED TO SOME RECEIVERS

(W54) COMPONENT LOCATIONS—MODEL 1374

A.M. Alignment Table:

Apply a 30 per cent modulated signal as below:	Set receiver controls to:	Adjust in order for maximum output:
1. 470kHz to VT4 base with 0·1 μF capacitor in each lead.	Volume control at maximum. Tone in "high" position. Check pointer travel. High frequency end of M.W. band.	Cores to T6, T4 and T2.
2. 370kHz to rod aerial via standard loop at 15 in. (40 cms.) from centre of rod.	L.W. band. High frequency end.	Trimmer C53
3. As (2), but 145kHz.	L.W. band. Low frequency end.	Core of L7

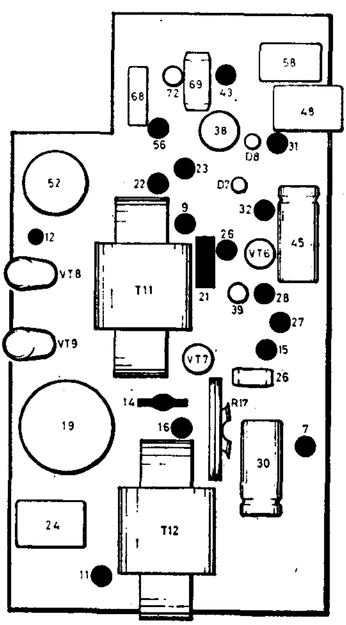
A.M. Alignment Table (continued):

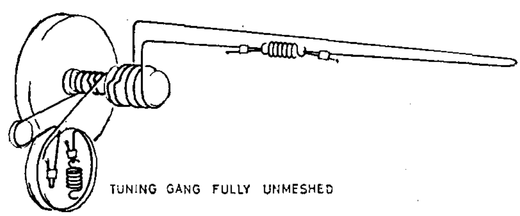
4. As (2), but 333kHz.	L.W. band.	900 metres.	Trimmer C43.
5. As (2), but 166kHz.	L.W. band.	1800 metres.	Position of L5 on rod.
6. Repeat steps (2) to (5). Seal position of L5.			
7. As (2), but 1650kHz	M.W. Band.	High frequency end.	Trimmer C54.
8. As (2), but 520kHz.	M.W. band.	Low frequency end.	Core of L8.
9. As (2), but 1500kHz.	M.W. band.	200 metres.	Trimmer C44.
10. As (2), but 600kHz.	M.W. band.	500 metres.	Position of L6 on rod.
11. Repeat steps (7) to (10). Seal position of L6.			

Note: Output meter (Avo 8 or similar) connected across loudspeaker terminals.

PYE Model 1383

General Description: A nine-transistor F.M./A.M. portable receiver, with earphone and tape recorder sockets. Battery 4 × 1½V (U11 or equivalent). Quiescent current 25mA approx.





W65 and W66

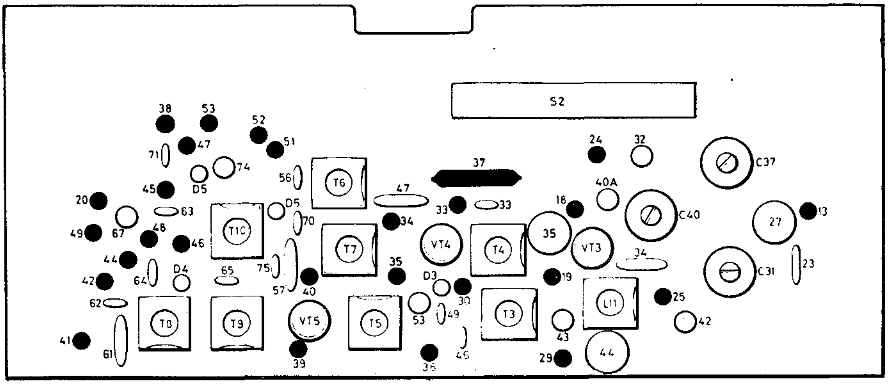
Left: (W65) Component Locations (Output Stage); *Above:* (W66) Drive Cord—Model 1383

Wavebands: L.W.: 1100–2000 metres. M.W.: 186–577 metres. V.H.F./F.M.: 86–102 MHz.

Audio Adjustment: In the event of the output pair (VT8 and VT9) or the driver (VT7) being replaced, it is essential to readjust the pre-set R17 as follows:

1. Break the link "A" and insert an Avo or similar meter (switched to 1 A range'. 2. Turn R17 to the position that provides a maximum reading (approx. 300 mA), then readjust to obtain a quiescent collector current of 10 mA. Replace link "A".

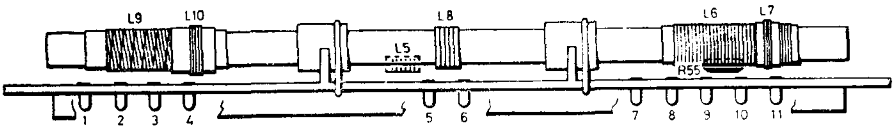
The voltage measured across the stabilizing diodes (D7 and D8) with 6 V input should read 1·12 V ±8 per cent. At 3 V input it is 0·95 V ±8 per cent (reference only).



W62

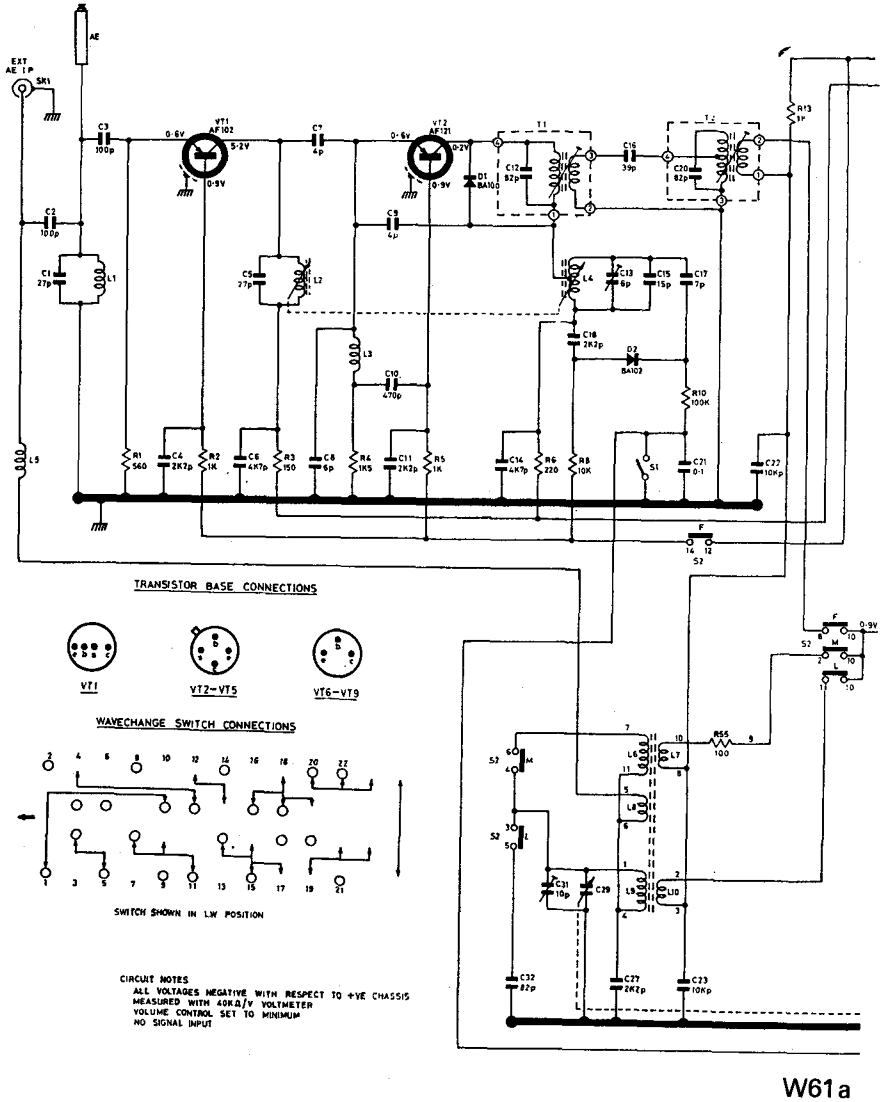
(W62) Component Locations (I.F. Stages)—Model 1383

F.M. Tuning Mechanism: The A.F.C. switch (S1) comprises two sections in parallel, one housed within the tuning spindle and the other inside the tuning knob. When the knob is pushed fully on, the spring-loaded pip in the centre of the spindle is depressed and S1 reverts to the open position. On pressing the red button S1 is closed, thus short-circuiting C21. The three red



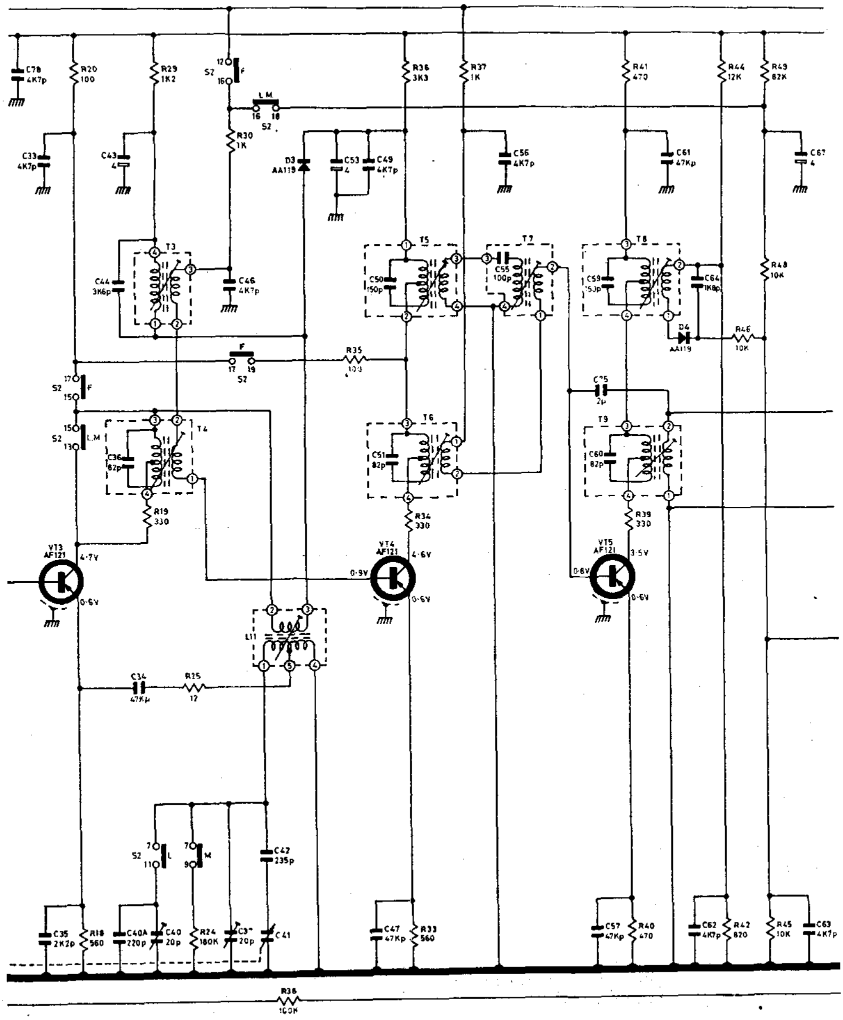
W63

(W63) A.M. Aerial—Model 1383



(W61a) CIRCUIT DIAGRAM—MODEL 1383 (PART)

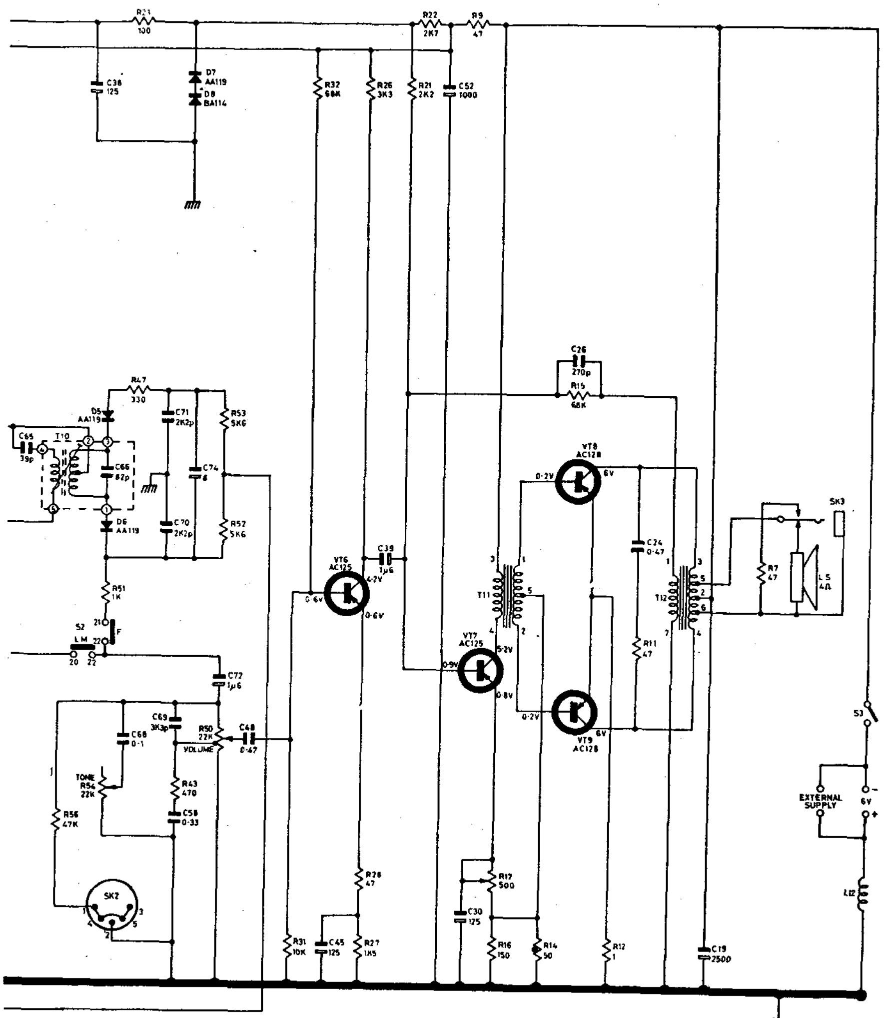
station indicators on the perimeter of the knob are "set" by rotating the knob until the button "locks" into position over the indicator, then tuning to the desired frequency with the button depressed.



W61b

(W61b) Circuit Diagram—Model 1383 (Part)

Chassis Removal: 1. Pull off F.M. tuning knob, then remove the three screws in the centre of the dial casting. Note that the curved spring is fitted under one screw and locates in the key at the bottom of the scale. 2. Remove dial casting and tuning scale assembly. 3. Remove two screws on underside of



W61c

(W61c) Circuit Diagram—Model 1383 (Continued)

cabinet and prise off backcover. 4. Remove one screw at either end of scale backplate and disconnect the black lead from the speaker frame. 5. The chassis may now be withdrawn to the extent of the speaker leads. When re-assembling, ensure that the tone and wavechange spindles engage the control

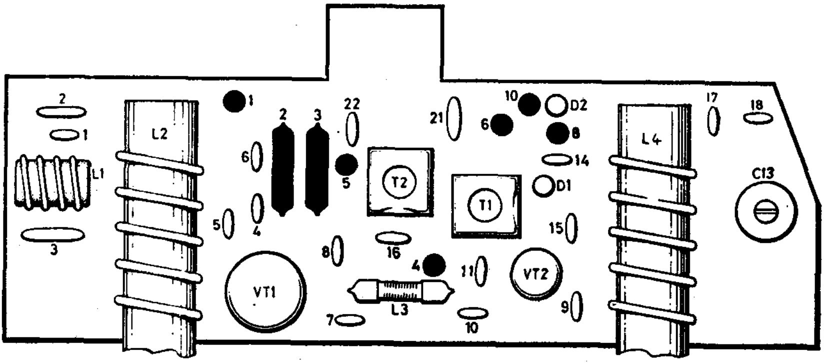
knobs. Care should be taken also when replacing the dial casting and tuning scale assembly.

Alignment (A.M.)

Apply a 30 per cent modulated signal as below:	Set receiver controls as as follows:	Adjust in order for maximum output:
* 1. 468kHz via 30KpF capacitor to VT3 base.	M.W. band. Low frequency end. Volume and tone controls at maximum. Check that pointers are aligned with datum marks at low frequency end of tuning scale.	Ferrite cores of T8, T7, T5 and T3.
2. 580kHz, via dummy aerial (15pF series followed by 60pF shunt) to external aerial socket.	M.W. band. 517 metres.	Core of L11 and position of L6 on ferrite rod.
3. As (2), but 1500kHz.	M.W. band. 200 metres.	Trimmers C37 and C31.
4. Repeat (2) and (3) until no improvement can be obtained. Seal L6.		
5. As (2), but 214kHz.	L.W. band. 1400 metres.	Trimmer C40 and position of L9 on ferrite rod. Seal L9.
* The most convenient injection point is at tag 9 adjacent to ferrite rod. Whilst carrying out this step, a 100Ω damping resistor should be connected in parallel with R55/L7 i.e. between tags 9 and 8.		

Alignment (F.M.)

Apply a 30 per cent modulated signal as below:	Set receiver controls as follows:	Adjust in order:
1. 10·85MHz ±150kHz deviation via 3·9pF to VT2 emitter. Valve voltmeter connected across C74	F.M. band. Low frequency end. Check that red button is aligned with datum on scale.	Cores of T10, T9, T6, T4, T2 and T1 for maximum output. Repeat until no improvement can be obtained.
2. As (1), but switch to A.M. modulation.	As (1).	Core of T10 for minimum output.
3. 86MHz ±150kHz deviation to external aerial socket. A.F.C. removed (short circuit C21).	As (1)	Trimmer C13 for maximum output.
4. As (3), but 94MHz.	94MHz.	Cores of L4 and L2 for maximum output.
5. Repeat (3) and (4) until no improvement can be obtained.		



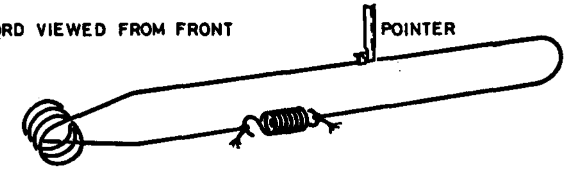
W64

(W64) COMPONENT LOCATIONS (V.H.F. TUNER)—MODEL 1383

PYE — Model 2041

General Description: The model 2041 or CR946 is a fully transistorised medium and long waveband receiver designed to operate from a supply of 12 V D.C. (145 mA) (both negative and positive ground wiring systems).

Wavebands: M.W.: 185–577 metres. L.W.: 1155–1930 metres. Pilot lamp: 14 V, 0·56 W. Fuse: 1·5 A.



W50

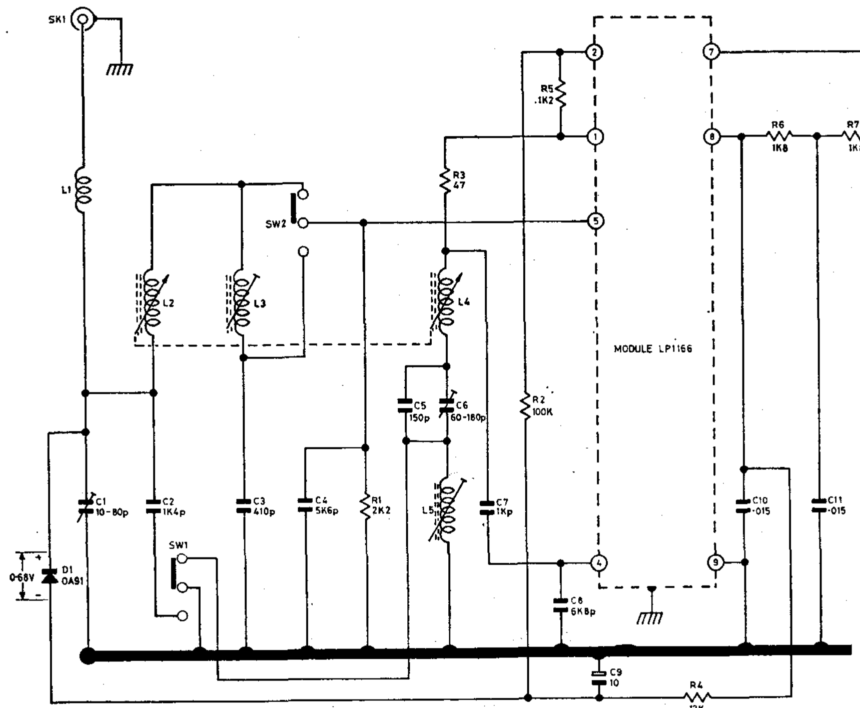
(W50) DRIVE CORD—MODEL 2041

Polarity: Lift up receiver top cover. It will be seen that a blue lead from the print panel is soldered to one of the tags at rear of volume control switch (same tag to which indicator lamp green lead is connected). Also, immediately above the speaker lead, a green lead from the print panel is soldered to a large tag on the metal chassis. This is correct for negative earth (ground) operation, ex factory. To change the polarity to positive earth, unsolder and interchange the blue and green leads.

Aerial Trimming: The aerial trimmer is located on the underside. The receiver should be trimmed to the aerial at the time of installation in the vehicle. To adjust the aerial trimmer, switch on and tune to a weak station near 200 meters. Using a small screwdriver, rotate the trimmer to obtain maximum volume. In the absence of a signal, carefully trim for maximum background noise.

Alignment (Preliminary): (*a*) Test Conditions: 14 V supply. All outputs and measurements to be carried out on negative ground operation. Signal input from standard Signal Generator to be applied to aerial socket via dummy aerial (15 pF series followed by 60 pF shunt). All input signals to be modulated 30 per cent at 400 Hz. All outputs into 3 Ω resistive load at 500 mW; volume control fully clockwise.

(*b*) It is important to keep signal levels down to a minimum during alignment to avoid A.G.C. detuning effects. No alignment whatsoever is to be carried out



W51a

NOTE
RESISTORS IN OHMS AND CAPACITORS IN μF UNLESS OTHERWISE STATED
SW1/SW2 SHEWN IN M.W. POSITION
ALL VOLTAGES (TAKEN WITH AVO 8) ARE NEGATIVE WITH RESPECT TO +VE LINE AND ARE MEASURED WITH NO SIGNAL INPUT

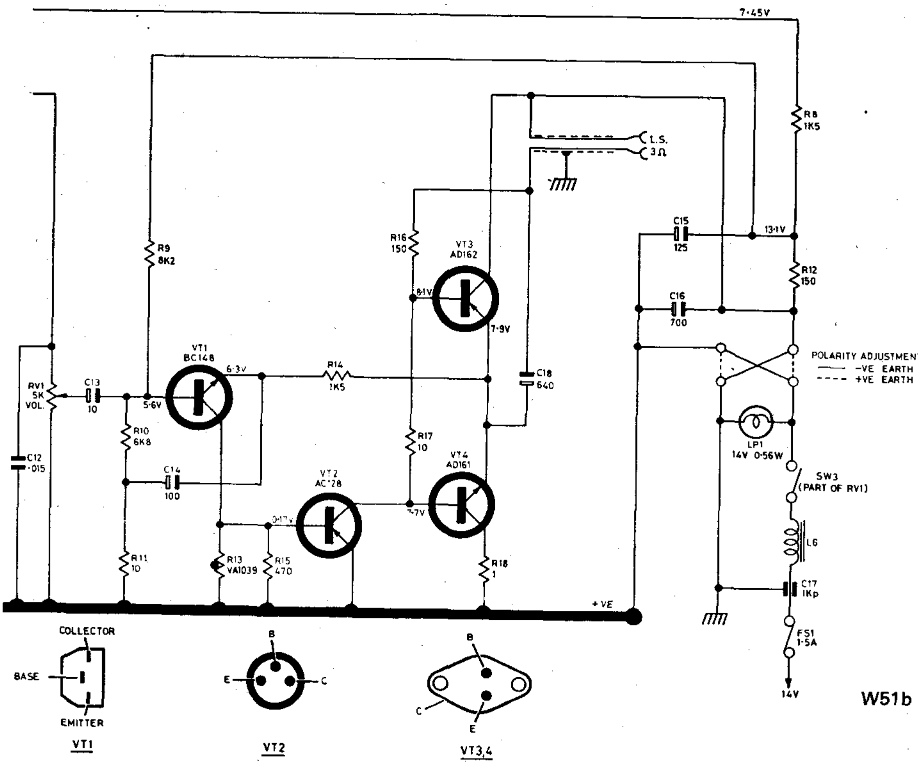
(W51a) CIRCUIT DIAGRAM—MODEL 2041 (PART)

on the module. The tuner is pre-aligned and will not normally require adjustment.

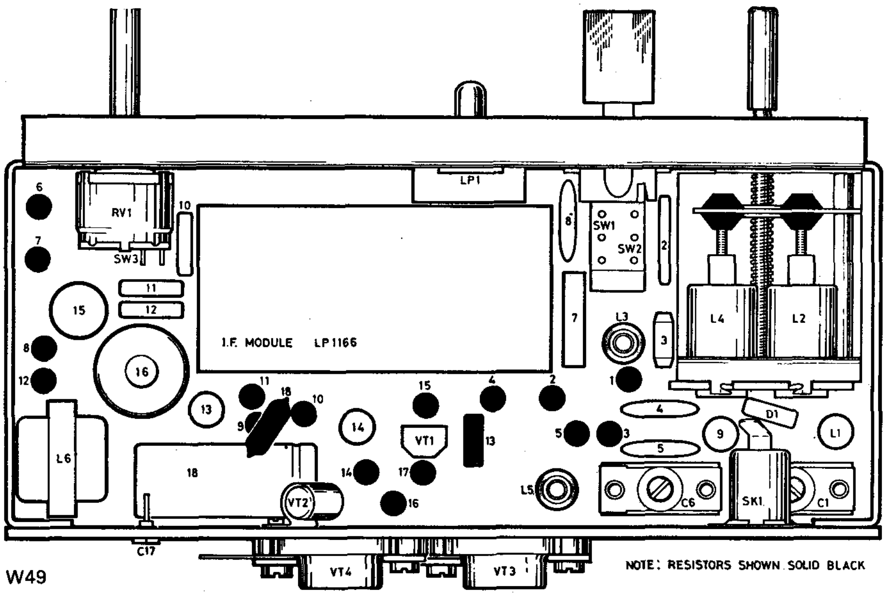
I.F. Rejector Alignment: Tune receiver to approx. 1000kHz on M.W. band. Then inject 470kHz into aerial socket and adjust L.W. aerial loading coil (L3) for *minimum* output, selecting trough farthest away from printed panel board.

M.W. Alignment: Tune to high frequency end of M.W. band and inject 1620kHz. Adjust M.W. oscillator trimmer C6 for maximum output. Next inject 1500kHz. Tune to signal and adjust M.W. aerial trimmer C1 for maximum output.

L.W. Alignment: Inject 1000kHz and tune to signal on M.W. Switch to L.W. and inject 225kHz. Adjust L.W. oscillator loading coil L5 for maximum output, selecting the peak farthest away from the printed panel board. Seal all cores.



(W51b) Circuit Diagram—Model 2041 (Continued)



(W49) Component Locations—Pye Model 2041

RADIOMOBILE Model 930

Provisional Information: Car radio with provision for positive or negative earth.

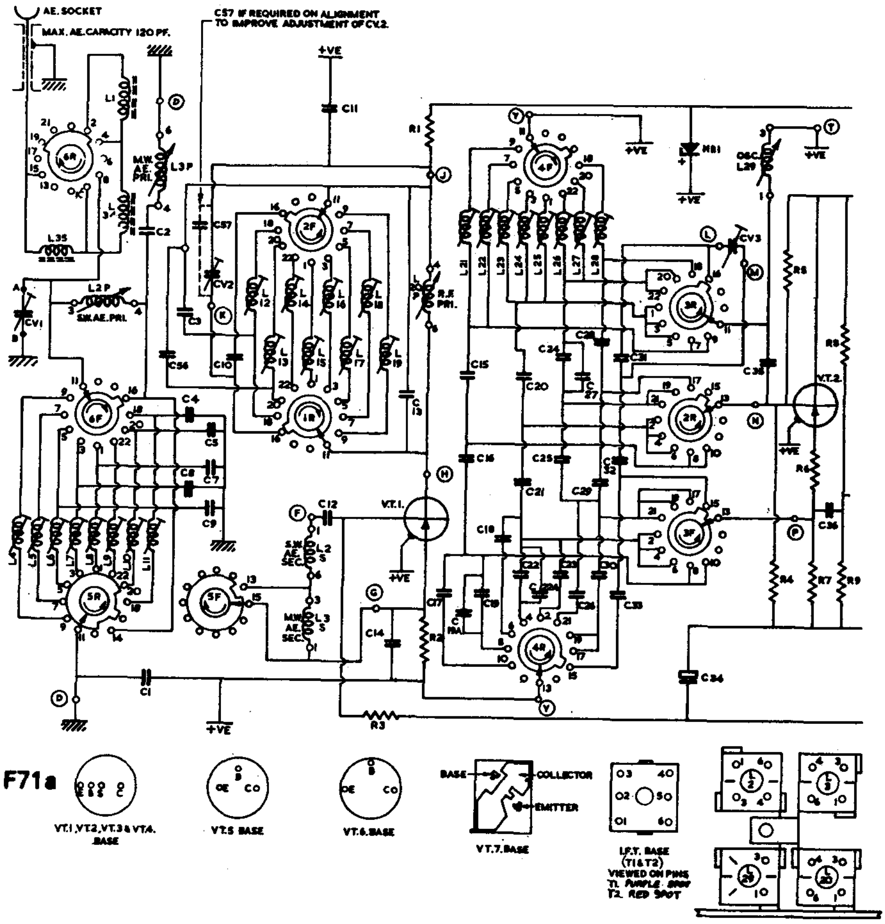
Alignment (General): The signal generator should be applied to the aerial socket via a 5 ft. length of co-ax. which has 12pF/ft.

Alignment (I.F.): Remove R.F. box lids. Switch to M.W. and tune to mid-scale. Inject 470kHz and peak T1 and T2.

Alignment (M.W.)

Input to Aerial	*Tuning*	*Adjust*
(*a*) 1620kHz	H.F. End (Carr. out)	CV1, 2 and 3
(*b*) 520kHz	L.F. End (Carr. in)	L29 core
(*c*) 1100kHz	To signal	L3, L20 core
(*d*) 600kHz	To signal	L3, L20 sleeve

Notes: 1. It will be necessary to spring out scale drum temporarily while adjusting tuning coil cores. 2. Repeat until no further improvement can be made. 3. Set pointer to read 1100kHz and seal with a contact adhesive during adjustment (*c*) above.

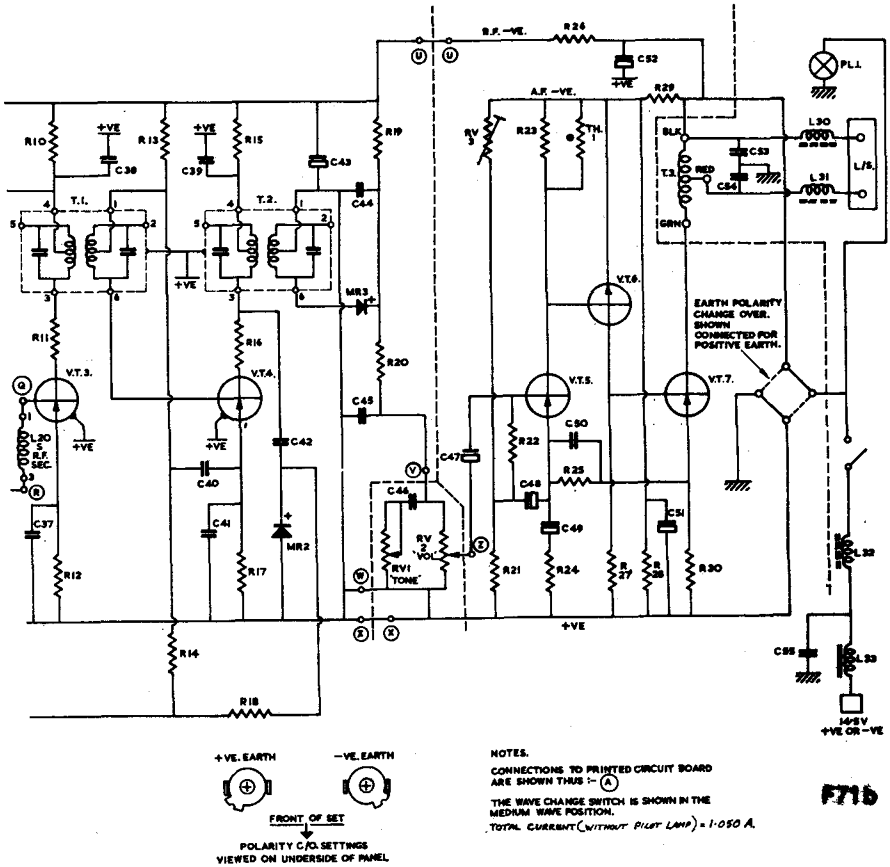


(F71a) Circuit Diagram—Model 930

Alignment (90M Band): Switch to 90M, set L2 sleeve to mid-position, replace R.F. box lids.

Input to Aerial	*Tuning*	*Adjust*
(*a*) 3·2MHz	L.F. end	L28 (90M Osc. pad.)
(*b*) 3·4MHz	To signal	L11 (90M Ae. pad.)
(*c*) 4·1MHz	To signal	L12 (90M R.F. pad.) L2 core S.W. Ae. coil

See notes overleaf for repetition details.



(F71b) Circuit Diagram—Model 930

Notes: 1. Repeat (*b*) and (*c*) above until no further improvement can be made. 2. When setting padder coil cores on all S.W. bands, the inner (nearest switch spindle) peak of core should be used. 3. When setting osc. padder coils, ensure that osc. frequency is above signal frequency by 470kHz.

Alignment (16M–60M Bands): Switch to appropriate band, inject the mid-band frequency, set tuning so that pointer indicates injected frequency on scale drum, then peak appropriate osc., ae. and R.F. padder coils. It may be necessary to "rock" the frequency of the input signal when aligning the ae. and R.F. padders to allow for "pulling" between the ae., R.F. and osc. circuits. All tuner cores and sleeves should be sealed with "Durofix" when alignment is completed. The padder coils and I.F. transformers are locked with elastic cord and need no additional locking.

Alignment Table

Band	*L.F. End* MHz	*Mid-Band* MHz	*Approx. H.F. End* MHz
M.W.	0·52	1·10	1·62
90M	3·20	3·90	4·60
60M	4·48	5·10	5·68
49M	5·66	6·20	6·69
41M	6·67	7·20	7·68
31M	9·16	9·60	10·00
25M	11·38	11·70	12·10
19M	15·00	15·35	15·70
16M	17·25	17·60	18·00

Capacitors

C1	0·22 μf
C2	1500 pf
C3	68 pf
C4	180 pf
C5	47 pf
C7	180 pf
C8	120 pf
C9	1100 pf
C10	1350 pf
C11	0·01 μf
C12	2200 pf
C13	330 pf
C14	0·1 μf
C15	33 pf
C16	330 pf
C17	270 pf
C18	470 pf
C19	200 pf
C19A	120 pf
C20	33 pf
C21	470 pf
C22	390 pf
C22A	91 pf
C23	560 pf
C24	33 pf
C25	680 pf
C26	680 pf
C27	15 pf
C28	56 pf
C29	820 pf
C30	1000 pf
C31	180 pf
C32	3900 pf
C33	3900 pf
C34	16 μf
C35	33 pf
C36	47 pf
C37	0·1 μf
C38	0·1 μf
C39	0·1 μf
C40	0·1 μf
C41	0·1 μf
C42	220 pf
C43	10 μf
C44	2000 pf
C45	2000 pf
C46	0·1 μf
C47	Elec 10 μf 16 V
C48	Elec 40 μf 2·5 V
C49	Elec 320 μf 2·5 V
C50	0·1 μf
C51	Elec 125 μf 10 V
C52	Elec 500 μf 18 V
C53	0·001 μf
C54	0·001 μf
C55	0·1 μf
C56	22 pf
C57	120 pf
CV1	10–80 pf
CV2	60–180 pf
CV3	30–140 pf

Resistors

R1	1 kΩ
R2	270 Ω
R3	3·3 kΩ
R4	2·7 kΩ
R5	5·6 kΩ
R6	10 Ω
R7	1 kΩ
R8	8·2 kΩ
R9	1·5 kΩ
R10	220 Ω
R11	330 Ω
R12	1·5 kΩ
R13	33 kΩ
R14	12 kΩ
R15	100 Ω
R16	330 Ω
R17	1 kΩ
R18	5·6 kΩ
R19	1·5 MΩ
R20	4·7 kΩ
R21	6·8 kΩ
R22	4·7 kΩ
R23	220 Ω
R24	4·7 Ω
R25	390 Ω
R26	120 Ω
R27	100 Ω
R28	220 Ω
R29	100 Ω
R30	1 Ω 2 W
RV1/RV2	vol/tone 10k/20k + switch
RV3	Preset 22k

Transistors
VT1 AF114
VT2 AF116
VT3 AF115
VT4 AF117
VT5 AC128
VT6 SE6002
VT7 AD149

Diodes
MR1 Voltage Reg. Diode
MR2 Diode
MR3 Diode

Coils
L1 Aerial choke
L2P+L2S } Inc. with
L3P+L3S } Tuner Unit
L4 16 Metre A/E Coil
L5 19 ,,
L6 25 ,,
L7 31 ,,
L8 41 ,,
L9 49 ,,
L10 60 ,,
L11 90 ,,
L12 90 Metre R/F Coil
L13 60 ,,
L14 49 ,,
L15 41 ,,
L16 31 ,,
L17 25 ,,
L18 19 ,,
L19 16 ,,
L20P+L20S Inc. with Tuner Unit
L21 16 Metre OSC Coil
L22 19 ,,
L23 25 ,,
L24 31 ,,
L25 41 ,,
L26 49 ,,
L27 60 ,,
L28 90 ,,
L29 Inc. with Tuner Unit
L30 Filter Choke
L31 Filter Choke
L32 Filter Choke
L33 Battery Choke

R.G.D. Model RR229

General Description: This model is electrically similar to the K.B. model KRO29, which is described earlier in this section of this volume.

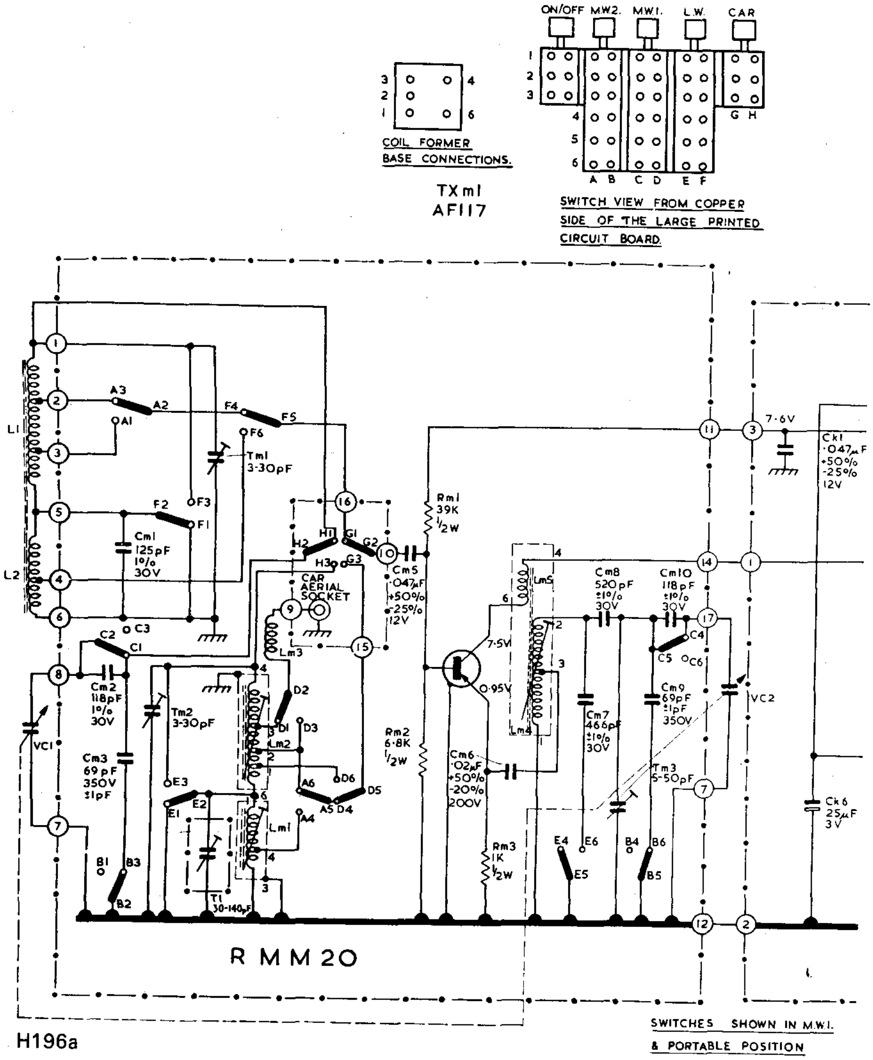
R.G.D. Model RR700

General Description: Radio receiver of modular construction with a power output of 1·4 W at 10 per cent distortion. Power supply: 18 V, 2 off 9 V battery (PP9). Battery life: 400 hours at an average listening level. Loudspeaker: elliptical, 25 Ω.

Wavebands: M.W.1: 185–280 metres. M.W.2: 275–555 metres. L.W.: 1175–1940 metres.

Circuit Description: This receiver has two sets of aerial coils, one set for operation as a portable, the other set for car radio. When operated as a portable, signals developed in the ferrite rod are coupled to the base of the mixer oscillator transistor TXm1 by the two tuned aerial coils L2 and L1. When operated as a car radio, the tuned aerial coils Lm2 and Lm1 are used to couple the signals from the car aerial to the base of TXm1. The tuned aerial circuits are as follows:

In the collector of TXm1 is the primary of a double tuned I.F. transformer Lk1 Lk2, protected against I.F. overloading by Dk1. The output from Lk2, which is capacitively coupled to Lk1 is fed to the base of Txk1 which is operated as an I.F. amplifier; the output being connected to the base of TXk2. TXk2 functions as a detector amplifier. When a signal is detected and amplified a D.C. component is produced, which causes the D.C. voltage on the collector to vary with signal strength. This variation in collector voltage is fed via Rk3 to TXk1 to provide A.G.C.

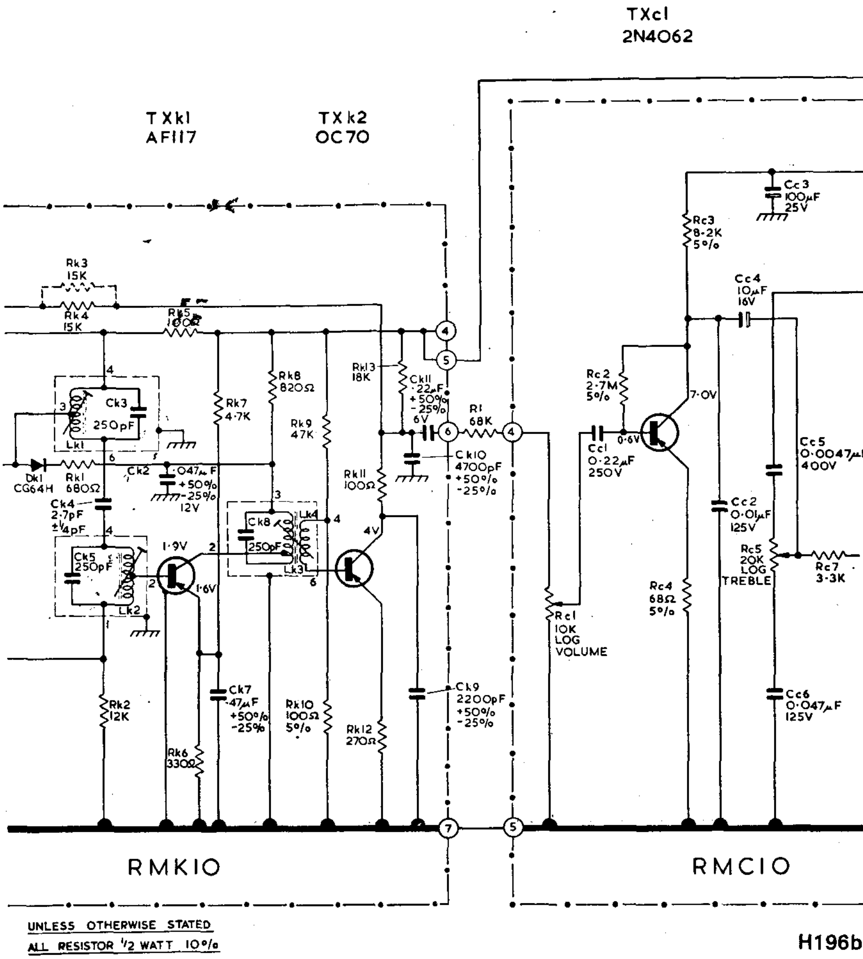


(H196a) Circuit Diagram—Model RR700 (Part)

The output from the volume control is fed to TXc1 and the tone control circuit, which together provide 15 dB of lift and cut at both the bass and treble ends of the audio band.

The signal is then applied to the base of TXa1, the audio pre-amplifier, which is directly coupled to TXa2, the driver transistor. This transistor is in turn directly coupled to the matched output pair TXa3 and TXa4. Diode Da1 is

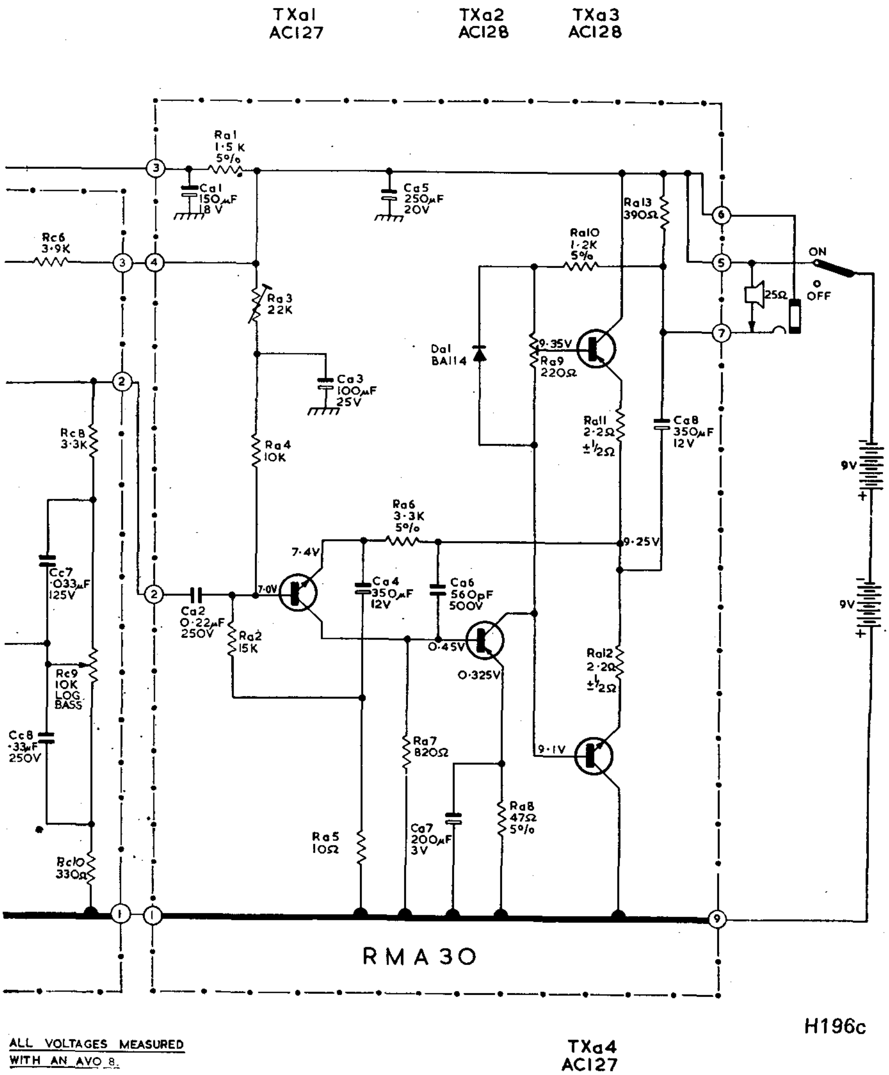
used for bias stabilisation of the output pair and Ra9 adjusts their quiescent current. Ra3 allows symmetrical clipping to be obtained and Ra5 and Ra6 provide overall negative feedback.



(H196b) Circuit Diagram—Model RR700 (Part)

Circuit Diagram Correction: Switches are shown in M.W.2 and portable position.

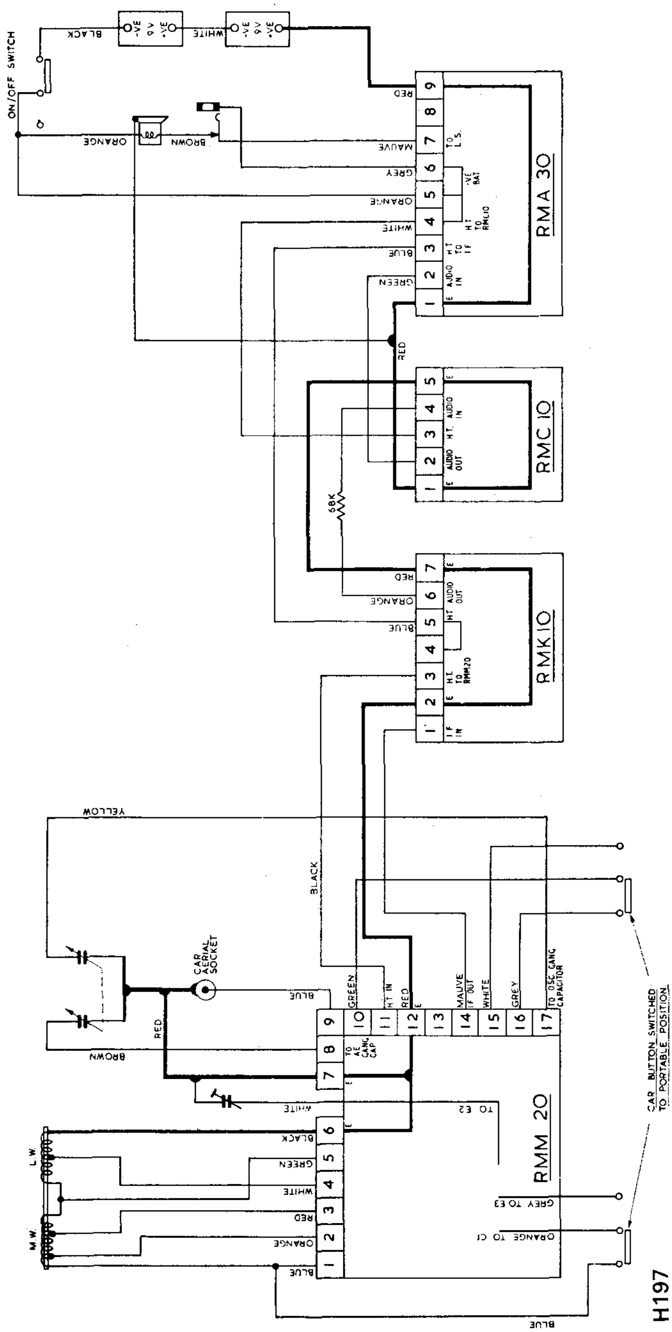
Audio Adjustment: Ra3 may be adjusted by setting the D.C. voltage at the junction of Ra11 and Ra12 to $-9{\cdot}25$ V (Avo model 8 on 25 V D.C. range). Turn



(H196c) Circuit Diagram—Model RR700 (Continued)

the volume control to minimum. Set Ra9 control fully anticlockwise. Connect milliammeter (to read quiescent current) in series with battery. Adjust Ra9 to increase the initial quiescent current by 3·5 mA. (Final quiescent current should be between 18 mA and 22 mA.)

Alignment (Equipment Required): 1. A signal generator covering the



(H197) Module Interconnections—Model RR700

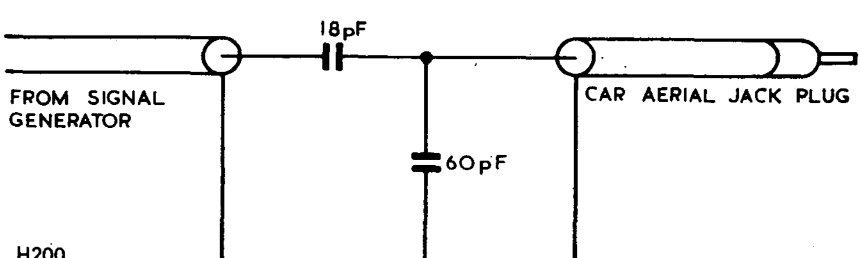
range 225–1620kHz with 10Ω output impedance. 2. Output power meter 25Ω. 3. Shielded test coil (85 turns of enamel covered wire) on 2 in. diameter former.

Alignment (I.F.): Set the signal generator to 470kHz and inject the signal via a 0·1 μF capacitor to the base of the mixer oscillator transistor TXm1 on the module RMM20. (A convenient means of connection is pin F5 on the L.W. push button when the radio is switched to portable.) Set gang to maximum capacity. Next Trim for maximum output by adjusting the I.F. coils in the following order: Lk3, Lk2, Lk1 and then readjust if required. Maintain output at approximately 500mW by adjustment of signal generator.

Alignment (R.F.): *With Car button released* connect the signal generator to the test coil, and position the coil co-axially with respect to the ferrite rod, at a distance of 8½ in. from its centre to the M.W. end of the rod.

The following operations should be carried out in the order indicated, being repeated until maximum sensitivity is obtained.

	Frequency	*Gang Position*	*Waveband Switch*	*Adjustments*
1	540kHz	Closed	M.W.2	Set pointer to datum. Adjust oscillator coil Lm4 on RMM20 module for maximum output.
2	1620kHz	Open fully	M.W.1	Adjust trimmer Tm3 for maximum output.
3	Repeat operations 1 and 2.			
4	600kHz	Max. signal	M.W.2	Adjust M.W. aerial coil L1 one the ferrite rod for maximum output.
5	1500kHz	Max. signal	M.W.1	Adjust trimmer Tm1 for maximum output.
6	Repeat operations 4 and 5 until maximum sensitivity has been obtained			
7	225kHz	Max. signal	L.W.	Adjust L.W. aerial coil L2 on the ferrite rod for maximum output.



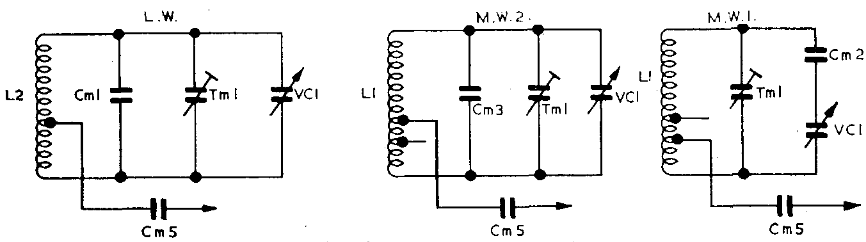
(H200) Dummy Aerial—Model RR700

With car button depressed: 1. Inject signal from generator via an 18pF capacitor to the car aerial socket. Switch to L.W. Screw trimmer T1 in tight but do not use excessive force. Adjust screened aerial coil Lm1 for maximum sensitivity at 225kHz.

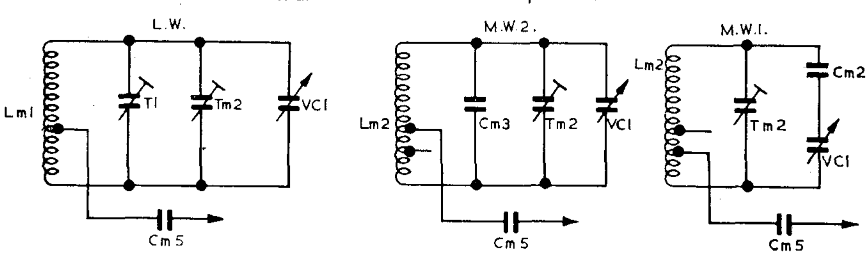
2. Inject signal from generator via dummy aerial (see appropriate diagram) to car aerial socket. Switch to M.W.2. Set signal generator to 600kHz. Tune gang capacitor for maximum sensitivity. Adjust screened aerial coil Lm2 for maximum sensitivity.

3. Switch to M.W.1. Set signal generator to 1500kHz. Tune gang capacitor for maximum sensitivity. Adjust trimmer Tm2 for maximum sensitivity.

4. Repeat until maximum sensitivity has been obtained.

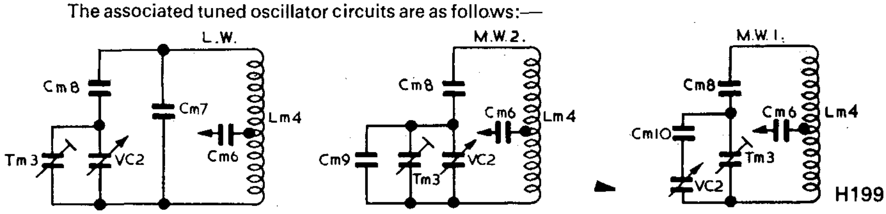


Aerial Circuits for Portable Operation



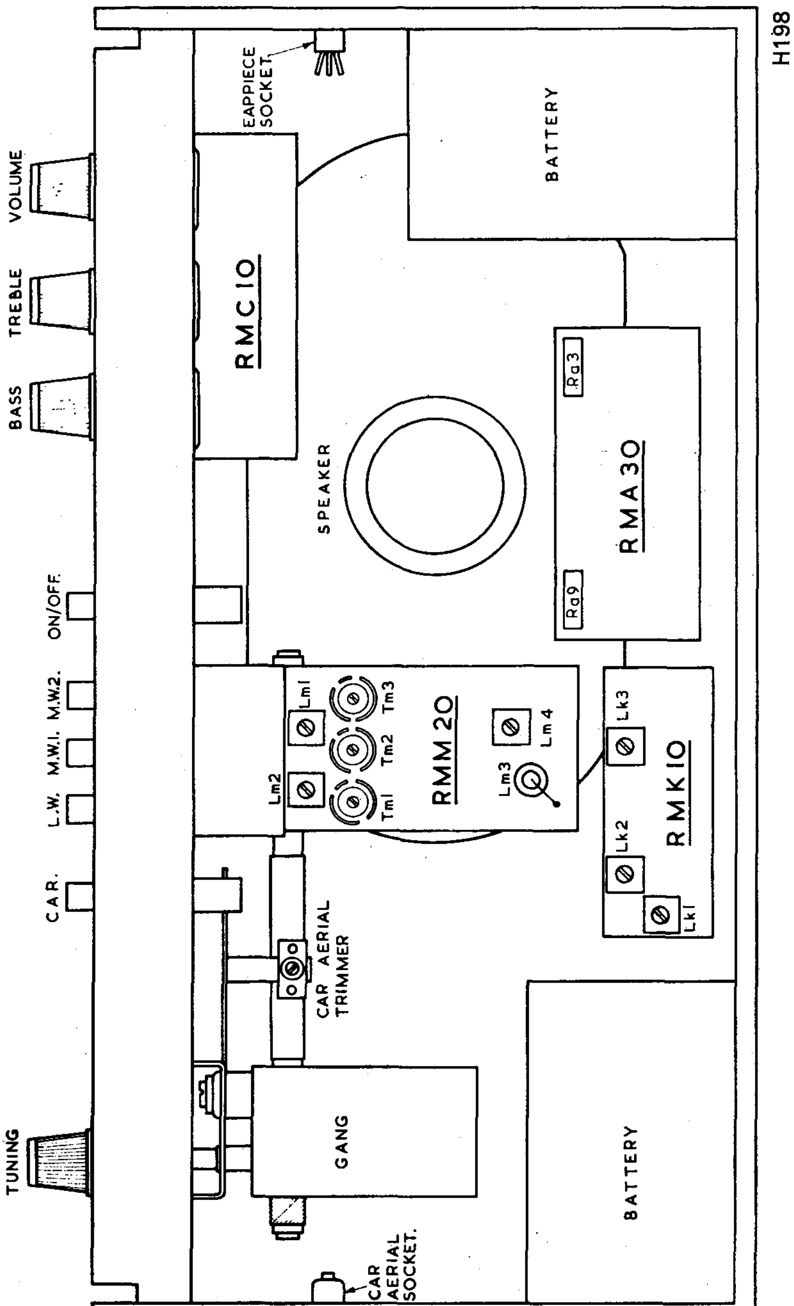
Aerial Circuits for Car Operation

The associated tuned oscillator circuits are as follows:—



(H199) Aerial and Oscillator Circuits—Model RR700

Car Aerial Alignment: Push the car and L.W. buttons and tune to B.B.C. 2 on 1500 metres. Collapse the car aerial until the output becomes small. Then tune T1 for maximum output. This alignment should be adequate for most cases, i.e. M.W. needs no re-aligning. If an exceptionally long lead is used, say 10 feet and above, M.W.1 can be re-aligned by tuning to a weak station around 200 metres and trimming Tm2 for maximum output.

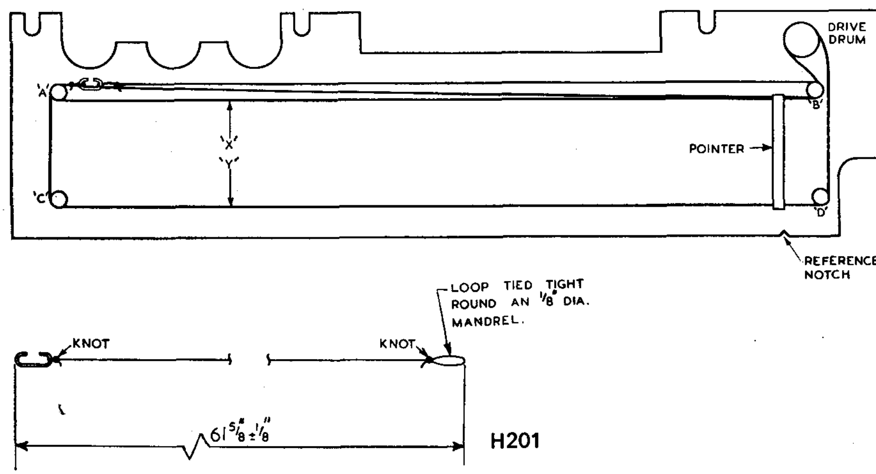


(H198) Overall Layout—Model RR700

Coil and Transformer Data

Circuit Ref.	*Description*	*Resistance in Ohms*
Lm1	L.W. aerial coil (car)	11·6
Lm2	M.W. aerial coil (car)	2·8
L1	M.W. aerial coil (portable)	1·8
L2	L.W. aerial coil (portable)	7·8
LM4	Oscillator coil	1·8
LK1	1st I.F. transformer	5·5
LK2	2nd I.F. transformer	5·5
LK3	3rd I.F. primary (pins 2 and 3)	3·7

All others less than 1 Ω.



(H201) DRIVE CORD ASSEMBLY—MODEL RR700

Drive Cord Assembly: Make up the cord as shown in the diagram. The dimension given is that when the cord is taut, then fully close the tuning gang.

Hook the link on to the chassis above guide "A", and then pass the cord anticlockwise around guides "C" and "D" and wind $4\frac{1}{4}$ turns anticlockwise on to the bottom pulley of the drive drum.

Pass the cord through the notch, in the top of the bottom pulley, into the top pulley and anticlockwise round the top pulley. Next pass the cord clockwise around the top groove of guide "B" and then anticlockwise around the bottom groove of guide "A" and the bottom groove of guide "B".

Unhook the link from the chassis and join the loop to the link, then pull the cord over the top of guide "A" and place it in the top groove.

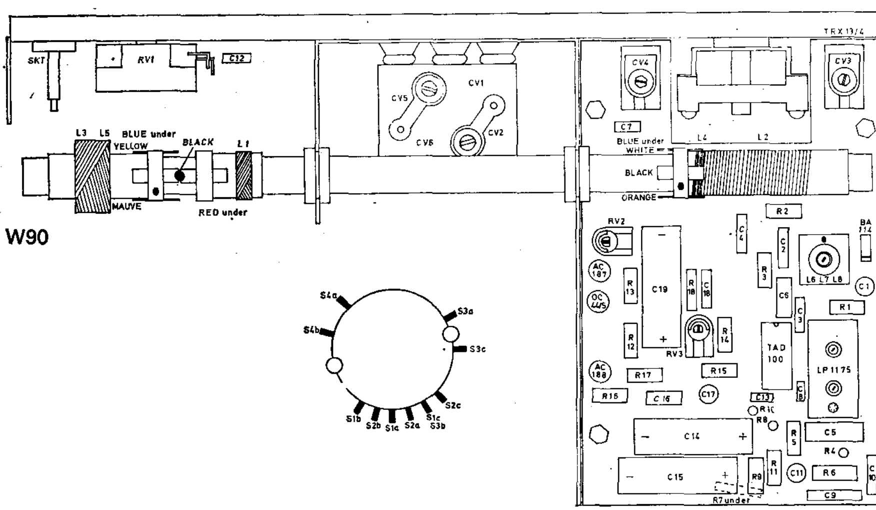
With the gang still fully closed, connect the pointer to cords "X" and "Y" such that it is in line with the reference notch on the chassis plate.

ROBERTS RADIO — Model RIC I

General Description: A two-waveband transistor portable receiver incorporating a Mullard TAD 100 module and ceramic resonator I.F. unit. Battery: 9 V (PP9). Quiescent current 20 mA.

Wavebands: M.W.: 182–555 metres. L.W.: 1160–2000 metres.

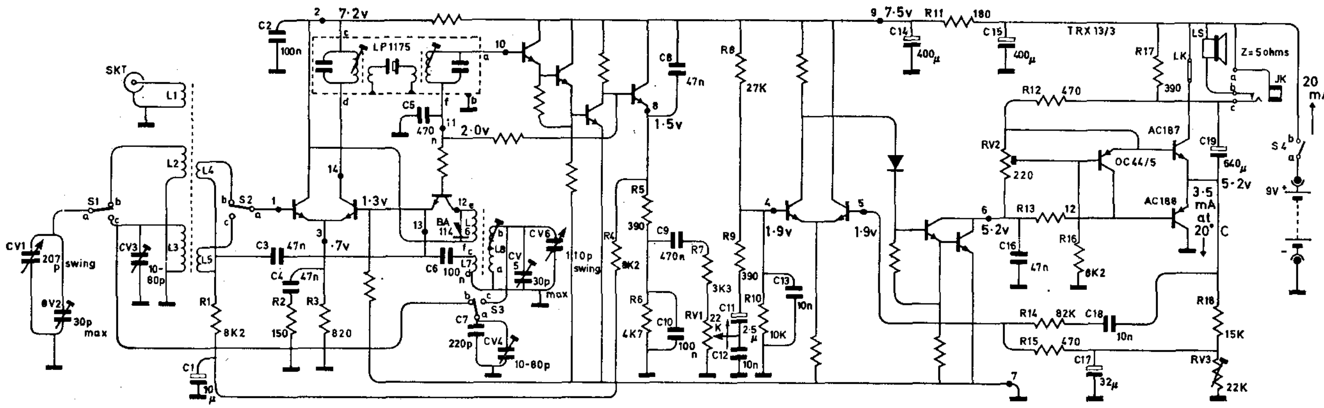
Dismantling: 1. Remove battery. 2. Loosen the three 4B.A. nuts holding battery bracket in place and remove bracket. 3. Remove the two 4B.A. nuts holding the loudspeaker and carefully remove to the extent of its leads. 4. Remove the two woodscrews at either side of chassis and withdraw the two wooden members. 5. The chassis may now be slid straight out of cabinet.



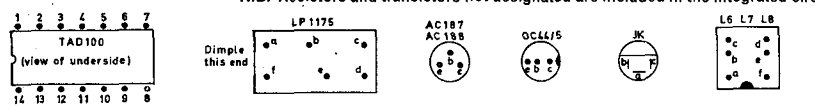
(W90) Component Locations—Model RIC1

Alignment (D.C.): All the following adjustments are carried out with a battery voltage of 9 V measured across C15. 1. Connect a voltmeter between junction C19/R18 and chassis, and, with volume at minimum adjust RV3 to give 5·2 V. 2. Connect a milliammeter in the red flex link (LK) under the print board and adjust RV2 to give an output stage quiescent current of 3·5 mA at 20° Centigrade. Allow one minute and recheck the 3·5 mA reading. 3. Observing a sine-wave output on an oscilloscope, adjust RV3 for symmetry at onset of clipping.

Alignment (I.F.): The I.F. transformers have been accurately aligned to the ceramic resonator frequency (470 kHz nom.) and no attempt should be made to realign them unless suitable display equipment is available to ensure a symmetrical response curve.



N.B. Resistors and transistors not designated are included in the integrated circuit.



All resistor values in ohms
All capacitor values in farads
All voltages measured with respect to battery negative (no signal input; volume at minimum)

W89

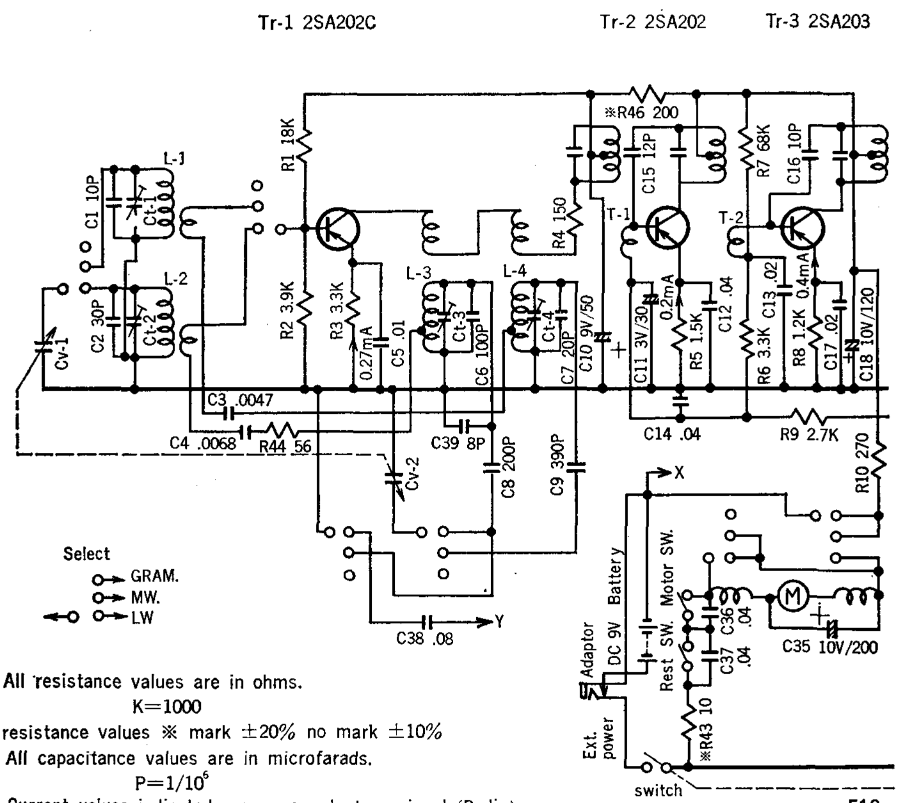
(W89) Circuit Diagram—Model RIC1

Operation	Wave-band	Pointer setting	Input	Adjust	Indication
1	MW	1224 M.	1360 kHz	CV5, CV2	Max. output
2	MW	1936 M.	580 kHz	L8, L2	Max. output
Repeat 1 and 2 for optimum results finishing with 1.					
3	LW	1224 M.	245 kHz	CV4, CV3	Max. output
4	LW	1936 M.	155 kHz	L3	Max. output
Repeat 3 and 4 for optimum results finishing with 3.					

Alignment (R.F.): Check that with gang fully meshed, the pointer coincides with the high wavelength end of the tuning scale. Connect an output meter in place of, or an A.C. voltmeter across, the loudspeaker. Output should be kept as low as possible to prevent A.G.C. action masking the alignment peaks. To avoid disturbance to the circuit all signals should be fed in via coupling coil. Calibration marks are provided on the scale at 1224 and 1936M. See also page opposite.

SANYO — Model G-2230E

General Description: Eleven-transistor portable stereophonic radiogram. Wavebands: M.W.: 187–550 metres; L.W.: 850–2000 metres. Intermediate frequency 470kc/s. Sensitivity: L.W. 290μV/m; MW.: 150μV/m for 50mW. output. Maximum power output: Radio 900mW × 2; Gram 650mW × 2.



(F19a) Circuit Diagram—Model G-2230E (Part)

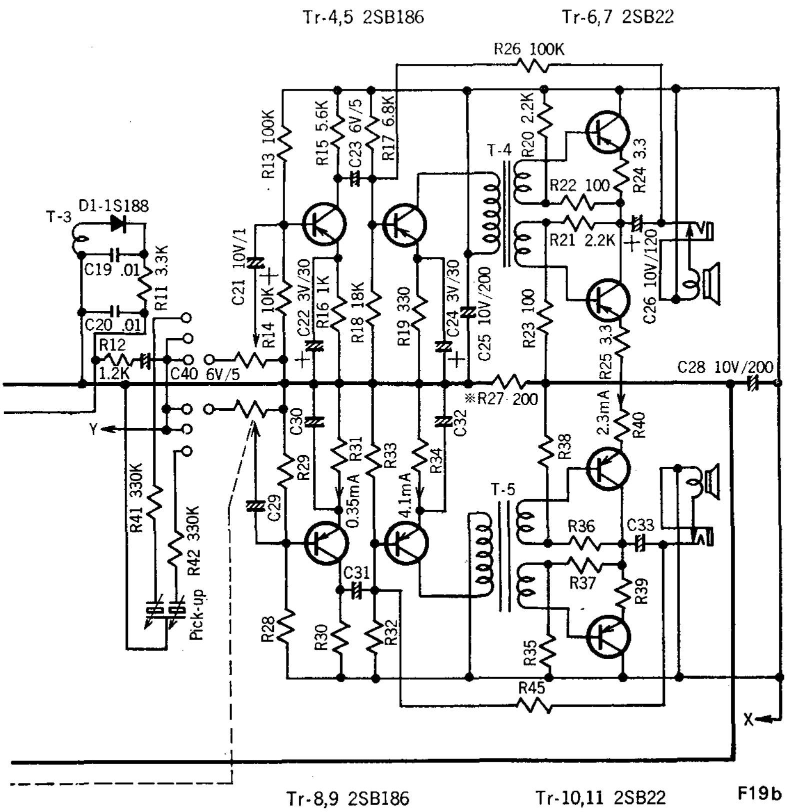
Maximum current: Radio 360mA; 400mA. Two 8 Ω 4 in. permanent-magnet speakers.

Alignment Procedures: Apply volt-meter across the L.S. Volume control at maximum position. Output of signal generator should be no higher than necessary to obtain output reading in order to avoid the effects of A.G.C.

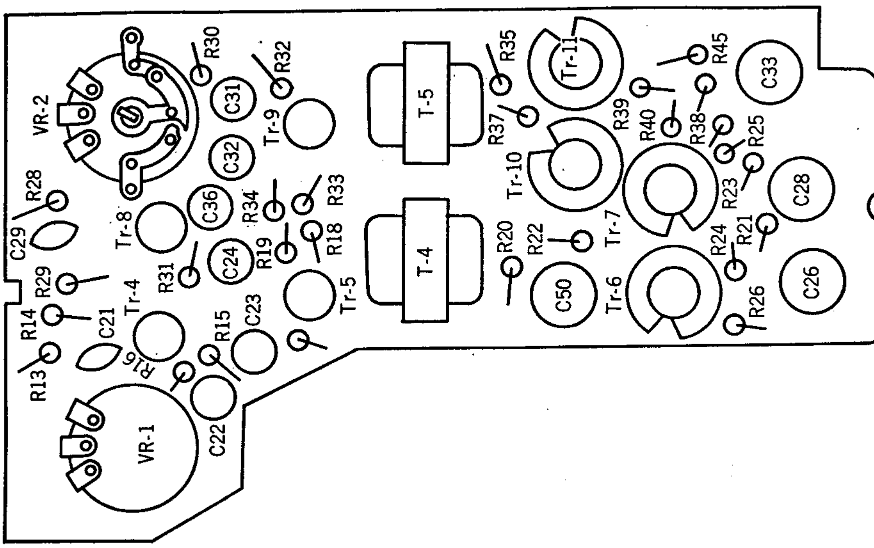
I.F. Alignment: 470kc/s–T3, T2 and T1.

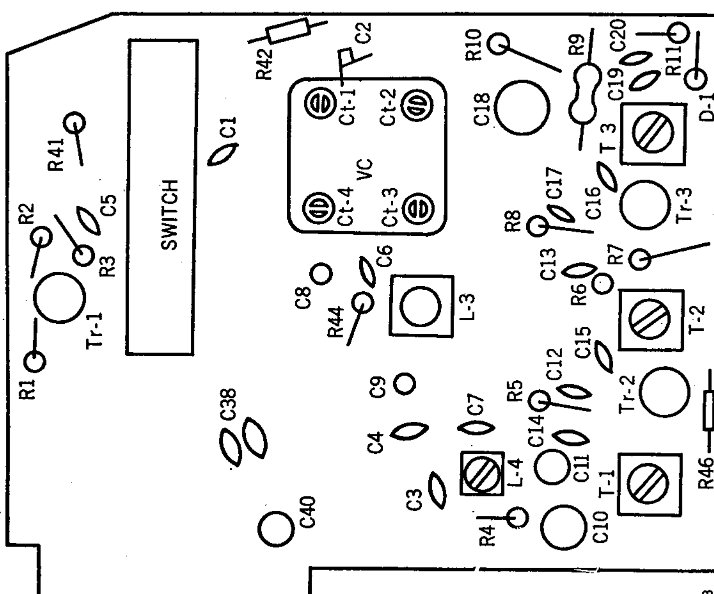
M.W./R.F. Alignment: 520kc/s–L4; 1650kc/s–M.W. osc. trim Ct 4. Repeat. 600kc/s–L1; 1400kc/s–M.W. aerial trim Ct 1. Repeat.

L.W./R.F. Alignment: 140kc/s–L3; 360kc/s–L.W. osc. trim Ct 3. Repeat. 150kc/s–L2; 350kc/s–L.W. aerial trim. Ct 2. Repeat.



(F19b) Circuit Diagram—Model G–2230E (Continued)





F18

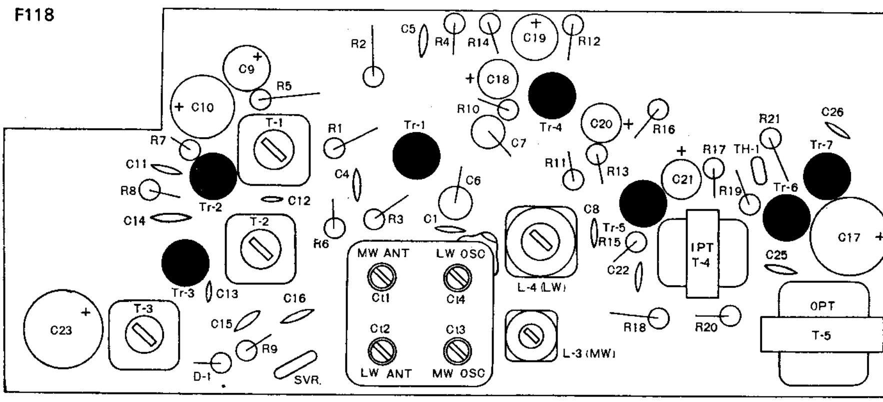
(F18) Component Lay-out

SANYO Models 7L-706(E) and 7L-706(N)

General Description: Seven-transistor portable radio receiver with a power output of 200mW. Batteries: 4·5 V, 3 off UM–3. Loudspeaker: 7 Ω. Current drain: quiescent 10mA.

Wavebands: M.W.: 185–550 metres. L.W.: 850–2000 metres.

F118



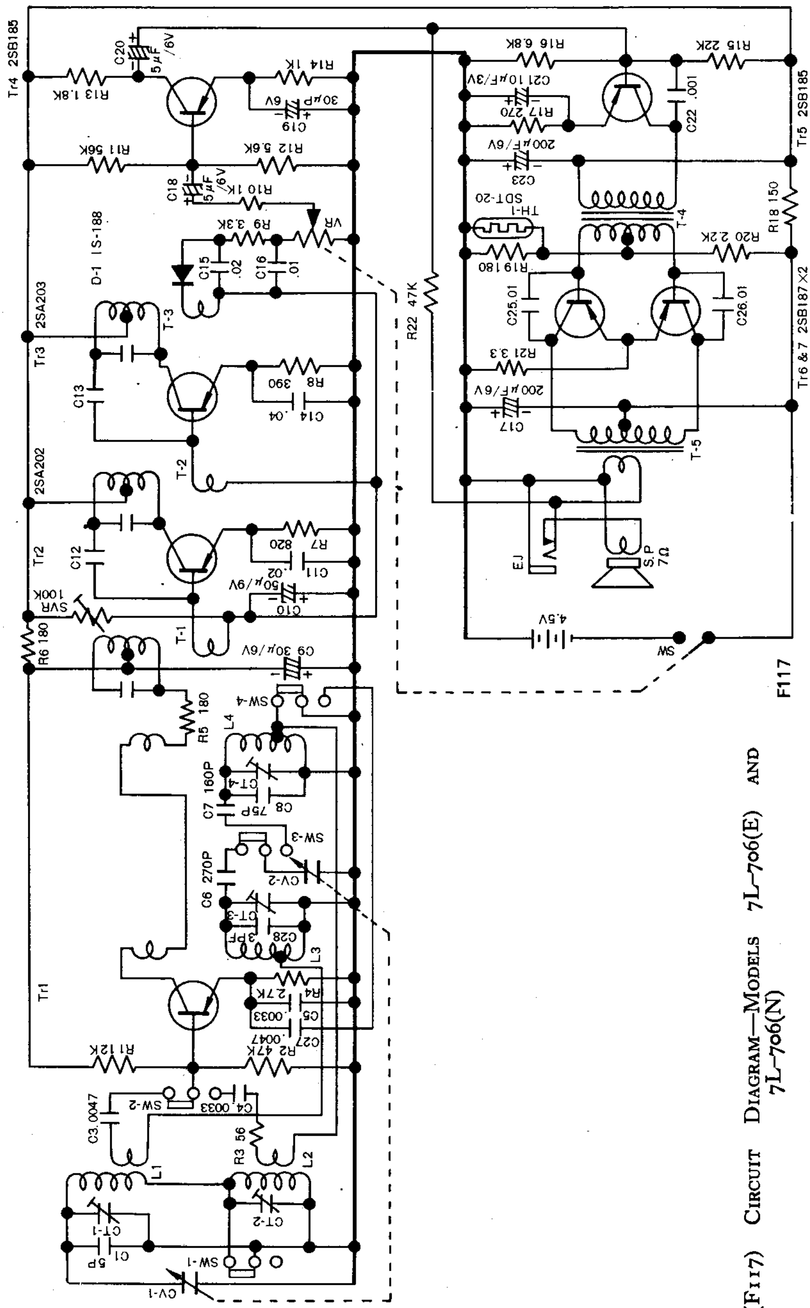
(F118) Component Locations—Models 7L706(E) and 7L–706(N)

Sensitivity: M.W. (100μV for 10mW). L.W. (200μV for 10mW).

Alignment Table

Stage	*Switch*	*Sig. Gen.*	*Dial*	*Adjust*
I.F.	M.W.	470kHz	Low end	I.F.T.'s T1, T2 and T3
M.W.	M.W.	520kHz	Low end	M.W. osc. coil L4
M.W.	M.W.	1650kHz	High end	M.W. osc. trim. CT4
M.W.	M.W.	600kHz	600kHz	M.W. Ae. coil L2
M.W.	M.W.	1400kHz	1400kHz	M.W. Ae. trim. CT2
L.W.	L.W.	145kHz	Low end	L.W. osc. coil L3
L.W.	L.W.	360kHz	High end	L.W. osc. trim. CT3
L.W.	L.W.	160kHz	160kHz	L.W. Ae. coil L1
L.W.	L.W.	340kHz	340kHz	L.W. Ae. trim. CT1

Note: Inject signal via loop.



(F117) CIRCUIT DIAGRAM—MODELS 7L-706(E) AND 7L-706(N)

Circuit Diagram Notes: 1. Either value of following capacitors is used selectively; C12 (15pF or 18pF), and C13 (12pF or 15pF). 2. Bandswitch (S.W.1–S.W.4) shown in M.W. position.

SHARP Model FY-27L

General Description: A ten-transistor car radio which may also be used as a portable receiver powered by internal batteries. Wavebands covered are L.W., M.W., and F.M.

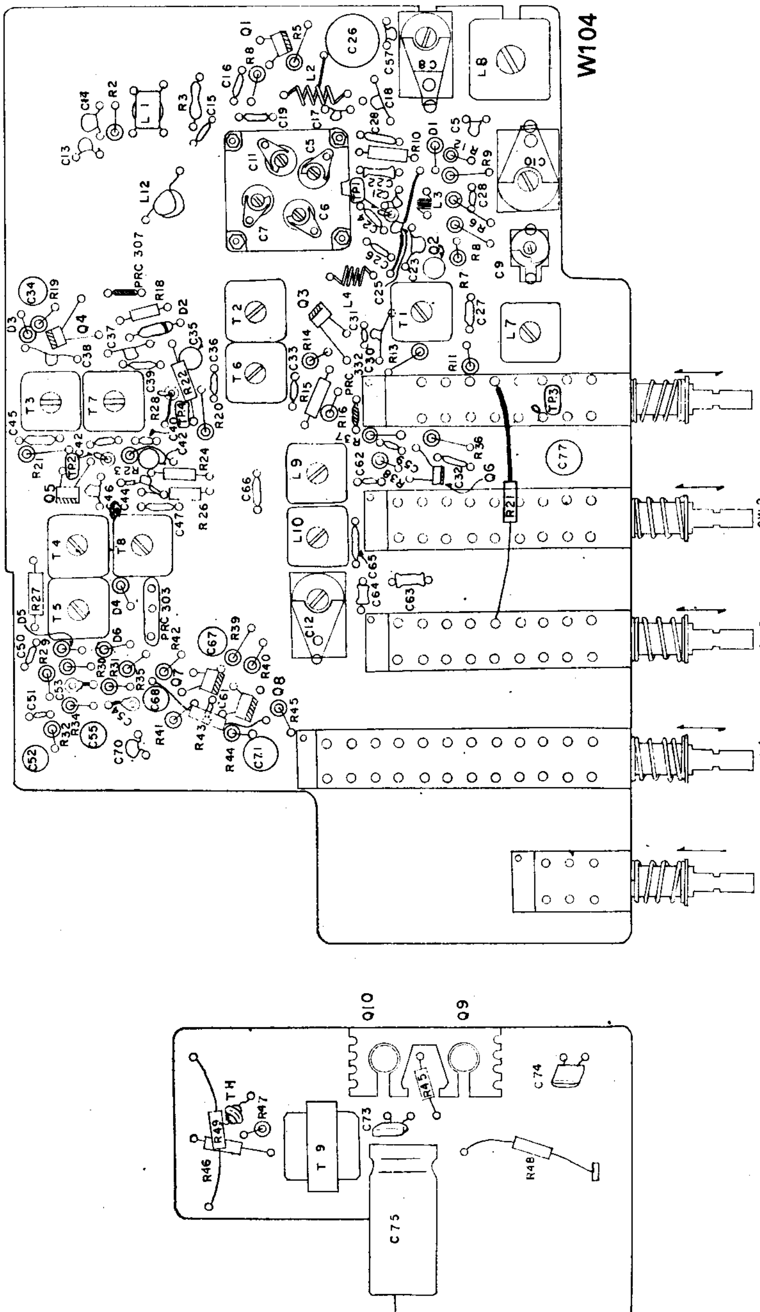
Frequency Ranges: L.W. 150–300 kHz. M.W. 530–1650 kHz. V.H.F./F.M. 87·5–108 MHz.

Batteries: Internal: 6V (4 × $1\frac{1}{2}$V). Car battery: 6 or 12V, positive or negative chassis (using specially designed car bracket connector type PN 94).

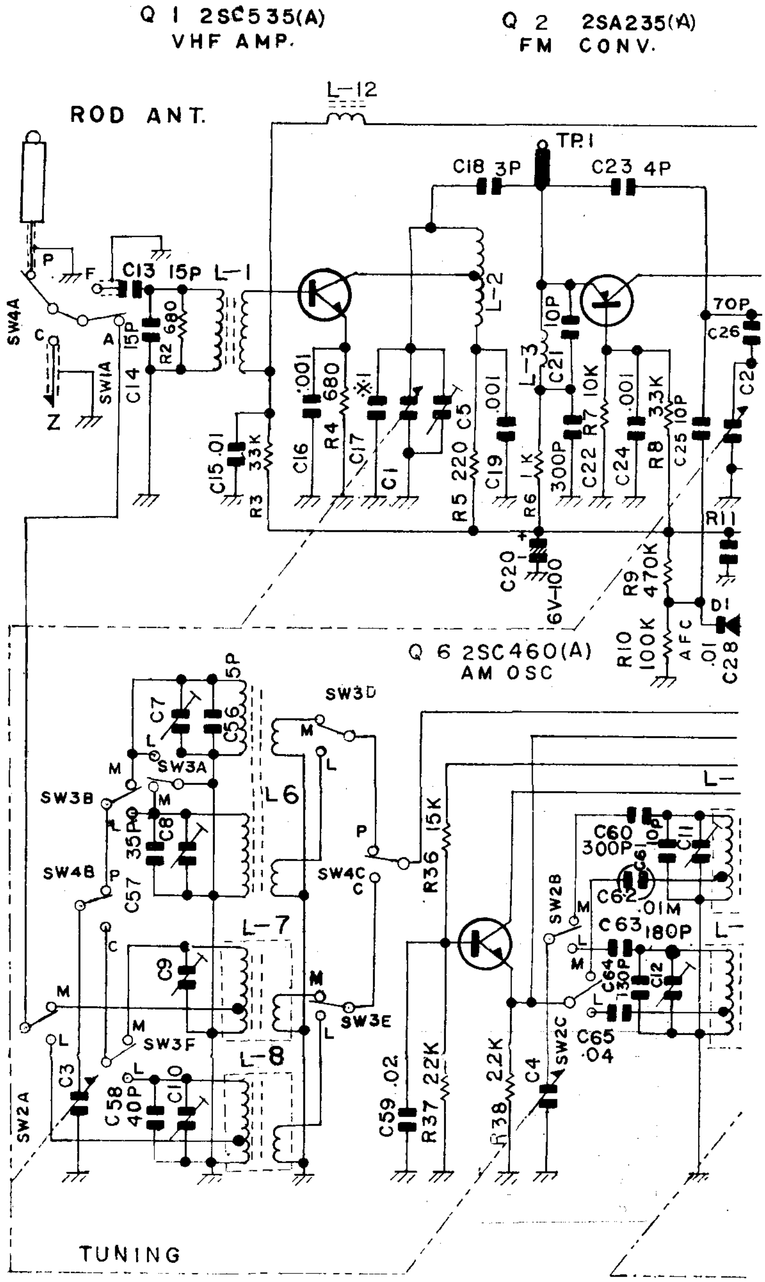
A.M. Alignment Chart

		Signal Generator		*Receiver*		*Adjust*
Step	*Band*	*Connection to receiver*	*Input signal frequency*	*Dial Setting*	*Remarks*	
1	M.W.	Connect signal generator through a 10kΩ resistor to the antenna tuning condenser. Connect ground lead to the receiver chassis.	Exactly 455 kHz (400 c/s, 30% A.M. modulated)	Tuning gang fully open (minimum capacity)	Adjust for maximum output on speaker voice coil lugs.	T8 T7 T6
2	M.W.	Use radiating loop Loop of several turns of wire, or place generator lead close to receiver for adequate signal pick-up. Connect generator output to one end of radiating loop	Exactly 520 kHz (400 c/s, 30% A.M. modulated)	Tuning gang fully closed (maximum capacity)	As Step 1	L9
3	M.W.	As Step 2	Exactly 1600 kHz 400 c/s, 30% A.M. modulated)	Tuning gang fully open (minimum capacity)	As Step 1	C11
4	M.W.	As Step 2	Exactly 600 kHz (400 c/s, 30% A.M. modulated)	600 kHz	See Note A	L6
5	M.W.	Use the car bracket PN94. Connect generator through a resistor to car antenna socket	Exactly 600 kHz (400 c/s, 30% A.M. modulated)	600 kHz	As Step 4	L7
6	M.W.	As Step 2	Exactly 1400 kHz (400 c/s, 30% A.M. modulated)	1400 kHz	As Step 4	C7
7	M.W.	As Step 5	Exactly 1400 kHz (400 c/s, 30% A.M. modulated)	1400 kHz	As Step 4	C9
8	M.W.	Repeat Steps 2, 3, 4, 5, 6 and 7 until no further improvement is obtained				
9	L.W.	As Step 2	Exactly 145 kHz (400 c/s, 30% A.M. modulated)	Tuning gang fully closed (maximum capacity)	As Step 1	L10
10	L.W.	As Step 2	Exactly 310 kHz (400 c/s, 30% A.M. modulated)	Tuning gang fully open (minimum capacity)	As Step 1	C12
11	L.W.	As Step 2	Exactly 160 kHz (400 c/s, 30% A.M. modulated)	160 kHz	As Step 4	L6
12	L.W.	As Step 5	Exactly 160 kHz (400 c/s, 30% A.M. modulated)	160 kHz	As Step 4	L8
13	L.W.	As Step 2	Exactly 280 kHz (400 c/s, 30% A.M. modulated)	280 kHz	As Step 4	C8
14	L.W.	As Step 5	Exactly 280 kHz (400 c/s, 30% A.M. modulated)	280 kHz	As Step 4	C10
15	L.W.	Repeat Steps 9, 10, 11, 12, 13, 14 and 15 until no further improvement is obtained.				

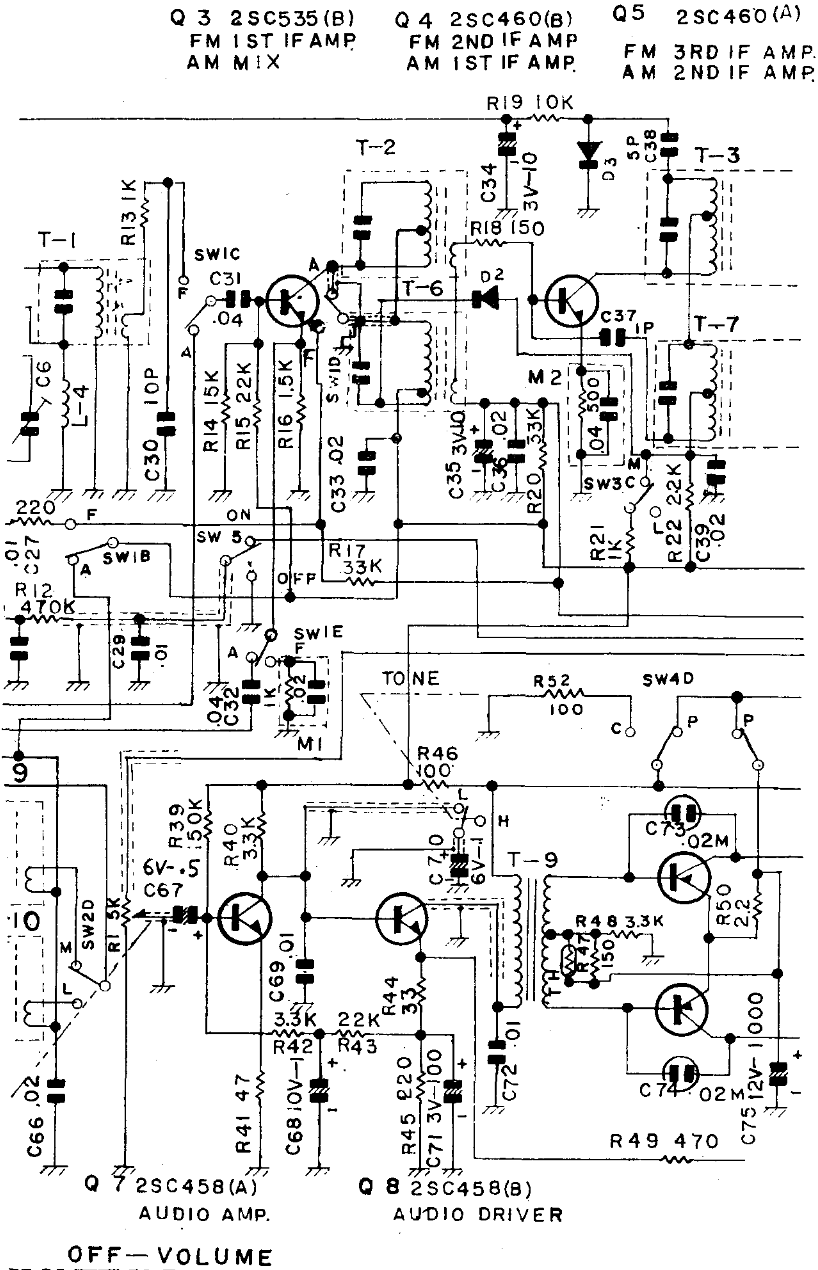
Notes: 1. Connect an output meter across the speaker voice coil lugs. 2. Set volume control for maximum. 3. Use lowest setting of signal generator capable of producing adequate indication on lowest scale of output meter. 4. Use a non-metallic alignment tool. 5. Repeat adjustments to ensure good results.



(W104) Component Locations—Model FY-27L

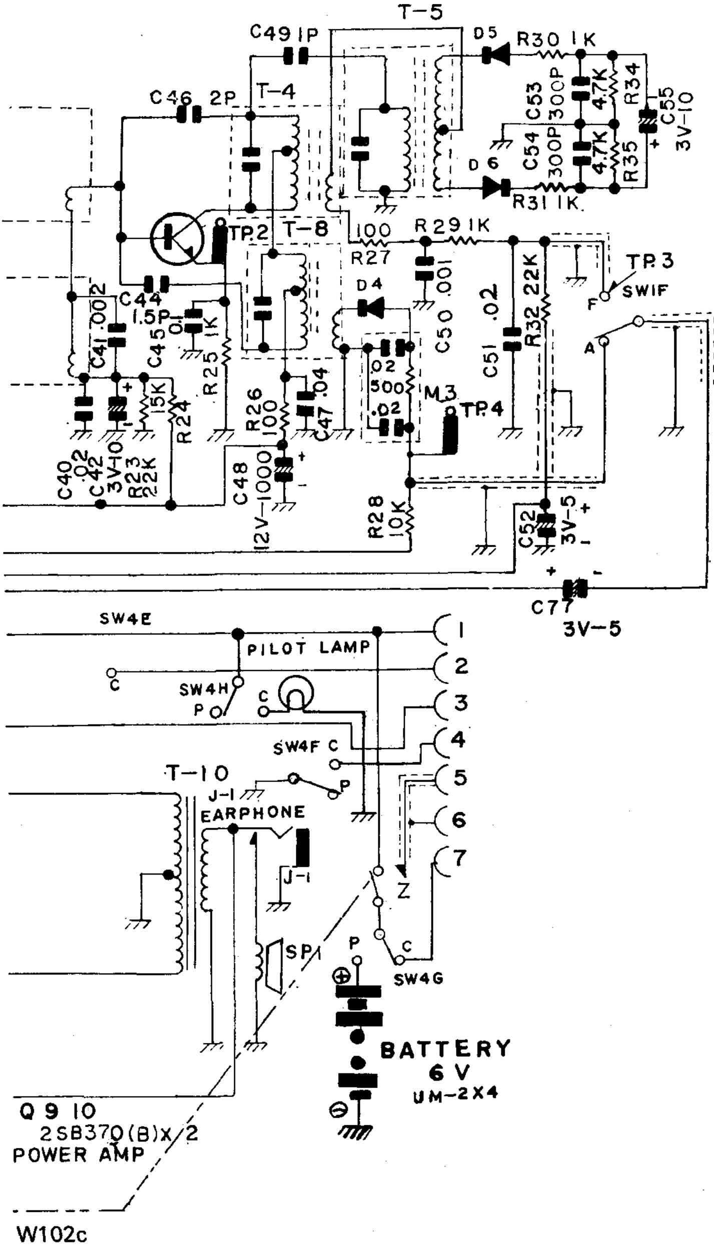


(W102a) Circuit Diagram—Model FY-27L (Part) W102a

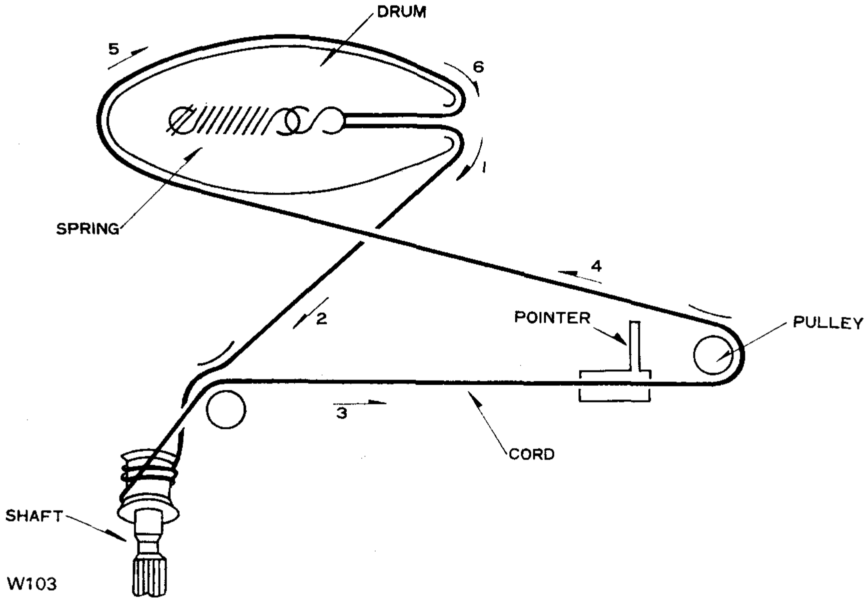


(W102b) Circuit Diagram—Model FY-27L (Part)

W102b



(W102c) Circuit Diagram—Model FY-27L (Continued)



(W103) Drive Cord—Model FY-27L

F.M. Alignment Chart

		Signal Generator		*Receiver*		*Adjust*
Step	*Band*	*Connection to receiver*	*Input signal frequency*	*Dial setting*	*Remarks*	
1	F.M.	Connect signal generator through a 1000 pF capacitor to converter emitter, test point 1 of Q 2. Connect generator ground lead to the receiver chassis	Exactly 10·7 MHz (400 c/s, 30% F.M. modulated)	Tuning gang fully closed (maximum capacity)	Connect receiver chassis through a 0·05 mfd capacitor to IF 3 collector, test point 2, of Q5	T3 T2 T1
2	F.M.	Same as Step 1	Exactly 10·7 MHz (Unmodulated)	Same as Step 1	See Note B	T5 T4
3	F.M.	Connect signal generator through a 100Ω resistor including output impedance of signal generator to the external antenna coil lug. Ground lead of generator connected to the receiver chassis	Exactly 87 MHz (400 c/s, 30% F.M. modulated)	Tuning gang fully closed (maximum capacity)	Adjust for maximum output at speaker voice coil lugs.	L4
4	F.M.	Same as Step 3	Exactly 109 MHz (400 c/s, 30% F.M. modulated)	Tuning gang fully open (minimum capacity)	Same as Step 3	C6
5	F.M.	Same as Step 3	Exactly 88 MHz (400 c/s, 30% F.M. modulated)	88 MHz	Same as Step 3	L2
6	F.M.	Same as Step 3	Exactly 108 MHz (400 c/s, 30% F.M. modulated)	108 MHz	Same as Step 3	C5
7	F.M.	Repeat steps 3, 4, 5 and 6 until no further improvement is obtained.				

Notes: (A) Check alignment of receiver antenna coil by bringing a piece of ferrite (such as a coil slug) near the antenna loop stick, then a piece of brass. If ferrite increases output, loop requires more inductance. If brass increases output, loop requires less inductance. Change loop inductance by sliding the bobbin towards the centre of ferrite core to increase inductance, or away to decrease inductance. This adjustment should not be required unless L6 has been replaced. (B) 1. Connect VTVM (0·1 V range D C. scale) between test point 3 and chassis ground. 2. Adjust T5 for VTVM 0 V. 3. Change signal generator frequency 10·7 MC + 100 KC and —100 KC approximately. 4. Adjust T4 for balanced peaks Peak separation should be approximately 200 KC.

Transistor Voltage (F.M./A.M.)

Q No	*Ec*	(*V*)	*Eb*	(*V*)	*Ee*	(*V*)	*Q No*	*Ec*	(*V*)	*Eb*	(*V*)	*Ee*	(*V*)
1	4·4	—	1·1	—	0·4	—	6	—	5·0	—	2·8	—	2·3
2	4·5	—	1·4	—	1·2	—	7	1·3	1·4	0·7	0·7	0·05	0·005
3	4·5	5·0	1·7	1·9	1·0	0·4	8	4·1	4·6	1·3	1·35	0·6	0·6
4	3·0	4·5	1·7	1·0	1·0	1·4	9	−6·0		−0·11		0	
5	4·3	4·8	2·5	2·7	1·8	2·0	10	−6·0		−0·11		0	

Chassis Removal: Remove 5 screws located on the back of the cabinet and remove the back, top and bottom covers. To remove front panel remove 2 knobs on the front of the cabinet, then the 4 screws located on both sides of the cabinet and free the chassis from the cabinet. Remove screw securing telesopic antenna and pull it out to the front.

SOBELL — Model S336

General Description: This model is electrically similar to the G.E.C. model G820, which is described earlier in this volume.

SOBELL — Model S337

General Description: This model is electrically similar to the G.E.C. model G837, which is described in this volume on earlier pages of this section.

STELLA — Model ST340AT

General Description: This radiogram is electrically similar to Philips Model F6G42AT, information for which is given on page 291 of the 1967–68 volume.

STELLA — Model ST4001AT

General Description: This radiogram is electrically similar to Philips Model F5G53AT, information for which is given on page 320 of the 1968–69 volume.

STELLA — Model ST4500

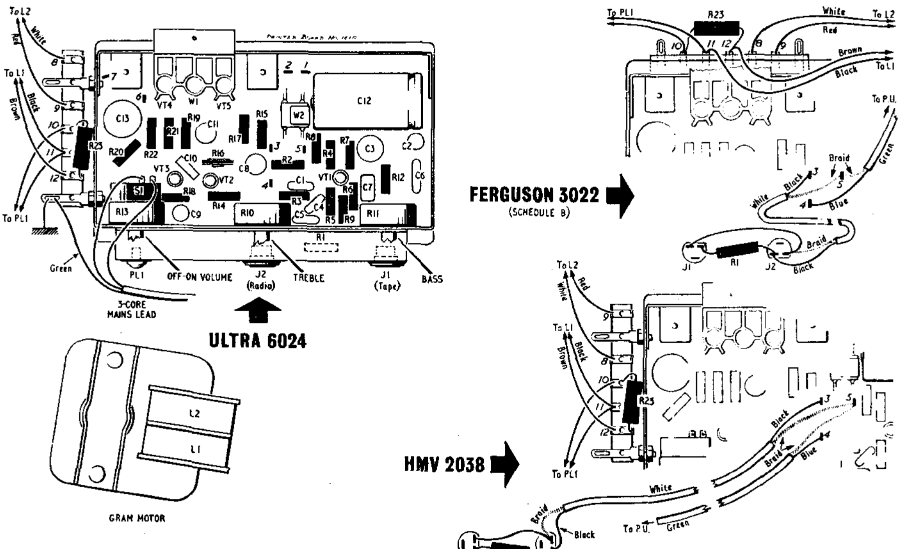
General Description: This radio is identical to the Philips Model 13RB262, information for which is given earlier in this section of this volume.

STELLA — Model ST7008T

General Description: This radio is electrically similar to Philips Model 13RL386, information for which is given earlier in this section of this volume.

ULTRA — Model 6024

General Description: Record player with an output power of 3 W. Record changer: BSR UA47, UA45 or UA15 with X3M cartridge and turnover stylus ST8. Loudspeaker: elliptical, 15 Ω.



H209

(H209) Component Locations of Model 6024 and Associated Models

Access for Service: Detach ventilation panel from inside record changer compartment then disconnect plug connections to loudspeaker. Take out

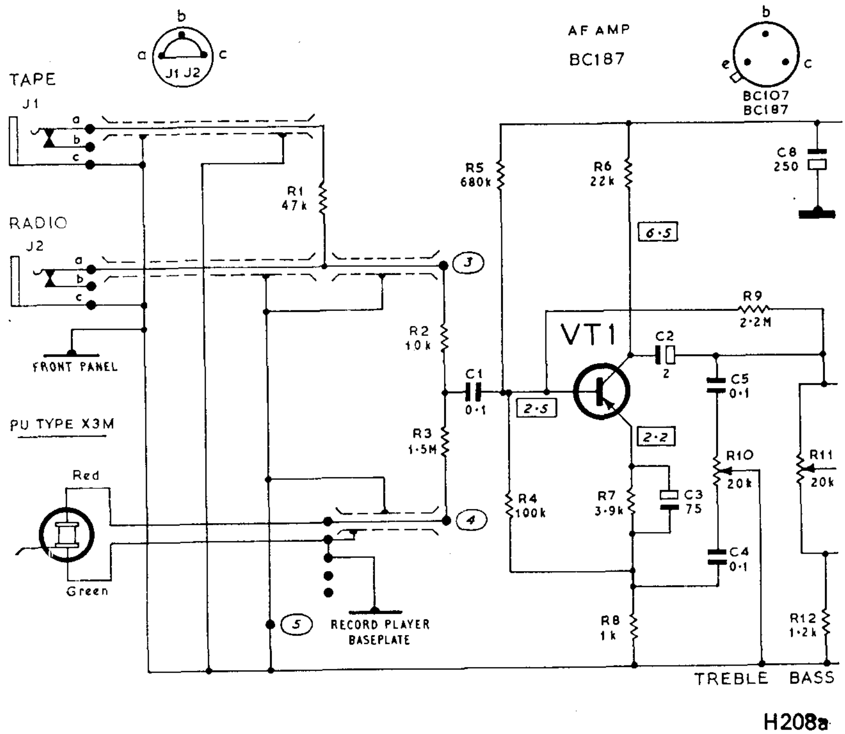
screw from left- and right-hand sides of cabinet to release motor board then lift and stand it on its right-hand edge on the cabinet floor.

Pull off the control knobs using a length of stout cord, wound around behind the knob, as a "puller". Remove two 4BA nuts and washers securing the chassis to the cabinet controls panel and lift chassis and motor board assembly clear of cabinet.

When refitting the chassis, ensure that the front edge of the chassis plate engages correctly on top of the chassis locating bracket affixed to the cabinet front.

Pick-up Cartridge Replacement: Ease forward the small spring clip at front end of pick-up head to release the cartridge then detach plugs from pins at rear end of cartridge taking note of colour coding to ensure correct connections to the replacement.

Circuit Diagram Note: All models. Figures in reactangles are voltage readings measured with a 20,000 ohm/volt meter and are with respect to the positive line except where otherwise indicated. Ringed figures indicate tag connection points.

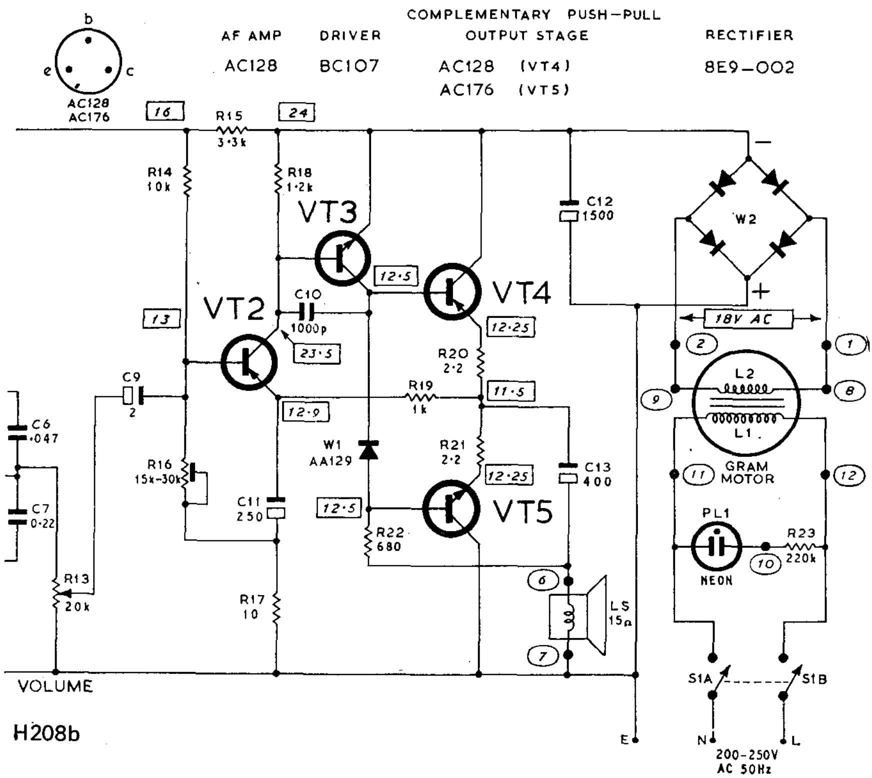


(H208a) CIRCUIT DIAGRAM—MODEL 6024 (PART)

Stylus Replacement: To remove worn stylus assembly, turn the indicator flag to either the L.P. or 78 position. A gentle downwards pressure and forward movement on the stylus assembly will release it from its mounting. After replacement, ensure that the stylus arm is engaged correctly within the V-shaped fork of the cartridge.

R16 Preset Adjustment: Connect an oscilloscope to tag 6 with the "earth" side of the oscilloscope connected to the chassis positive line via tag 7. Apply a 1 kHz signal between tags 4 and 5. Set the volume control to maximum and increase signal amplitude until clipping of the output waveform occurs. R16 should then be adjusted until the clipping is symmetrical on positive and negative going peaks.

Note: Components W1, VT4 and VT5 are fitted into the "heat sink" and a coating of silicone grease has been given to each to assist thermal conductivity. It is important that when replacing these transistors a coating of similar grease is applied in order to maintain the cooling action.



(H208b) Circuit Diagram—Model 6024 (Continued)

Tag Connections

Printed Board

1. To L2.
2. To L2.
3. Core of screened lead to J2 (unscreened lead in Model 6024)
4. Core of screened pick-up lead.
5. To braids of screened leads.
6. To loudspeaker.
7. To "earthy" side of loudspeaker.

Chassis Tag Panels

8. To L2.
9. To L2.
10. To neon indicator PL1.
11. To neon indicator PL1 and L1.
12. To L1.

Note: Tag 3 is not fitted in Model 6024, the unscreened lead being soldered direct to copper side of printed board.

ULTRA Model 6018(Sch.B)

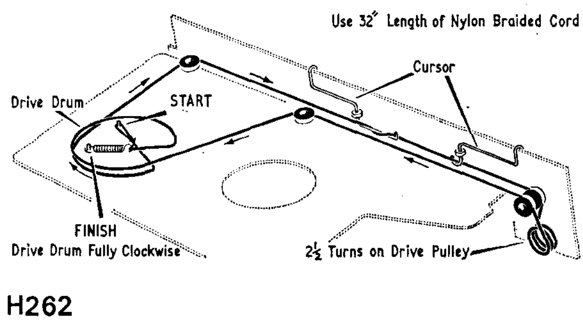
General Description: This model is basically similar to the H.M.V. model 2040, which is described in this volume.

ULTRA Model 6159

General Description: This model is similar to the Marconiphone model 4159, which is described on earlier pages of this section in this volume.

ULTRA Model 6160

General Description: Portable radio receiver with 600 mW power output. Aerials: ferrite rod for M.W. and L.W., telescopic rod for V.H.F./F.M. Loudspeaker: round, 35 Ω. Sockets: car or V.H.F. aerial, earphone (15–100 Ω) or tape. Battery: two 9 V (PP7).



(H262) Drive Cord—Model 6160

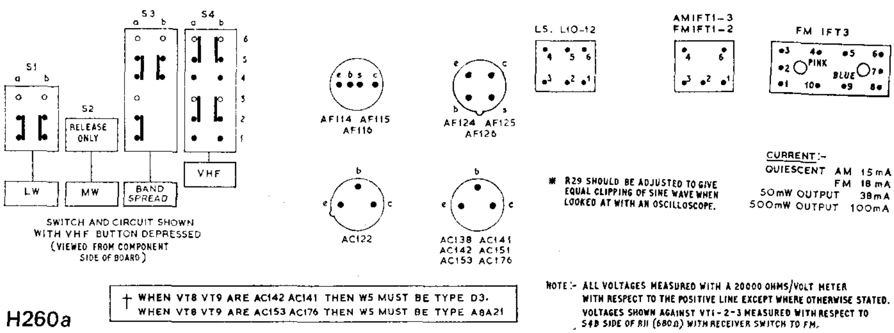
Wavebands: M.W.: 190–566 metres. B.S. 185–216 metres. L.W. 1120–2025 metres. V.H.F./F.M.: 87·7–101 MHz.

Access for Service: Slide open battery cover, disconnect and take out batteries. Complete access to the printed board may be gained by removing cabinet back cover which is retained by three countersunk screws in cabinet base. For access to drive cord and copper side of the printed board, pull off control knobs and unsolder lead on telescopic aerial. Take out five screws and washers securing printed board, then unsolder leads on loudspeaker tag panel. The printed board may then be lifted out without further disconnection.

Servicing Notes: To check oscillator operation, use an oscilloscope to measure the peak-to-peak voltage across R10, and compare with the voltage indicated in the Circuit Diagram for a correctly functioning oscillator. An alternative method is to connect a D.C. voltmeter across R10. If the oscillator is working properly, the voltage should drop slightly when the oscillator section of the tuning gang is short-circuited. To avoid the risk of short-circuiting resistor R34, in series with the negative supply line, all earthed output connections of test equipment should be suitably isolated from the receiver chassis. The tuning gang is of special construction and no attempt should be made to clean or repair it. Faulty gangs should be returned to the Service Depot.

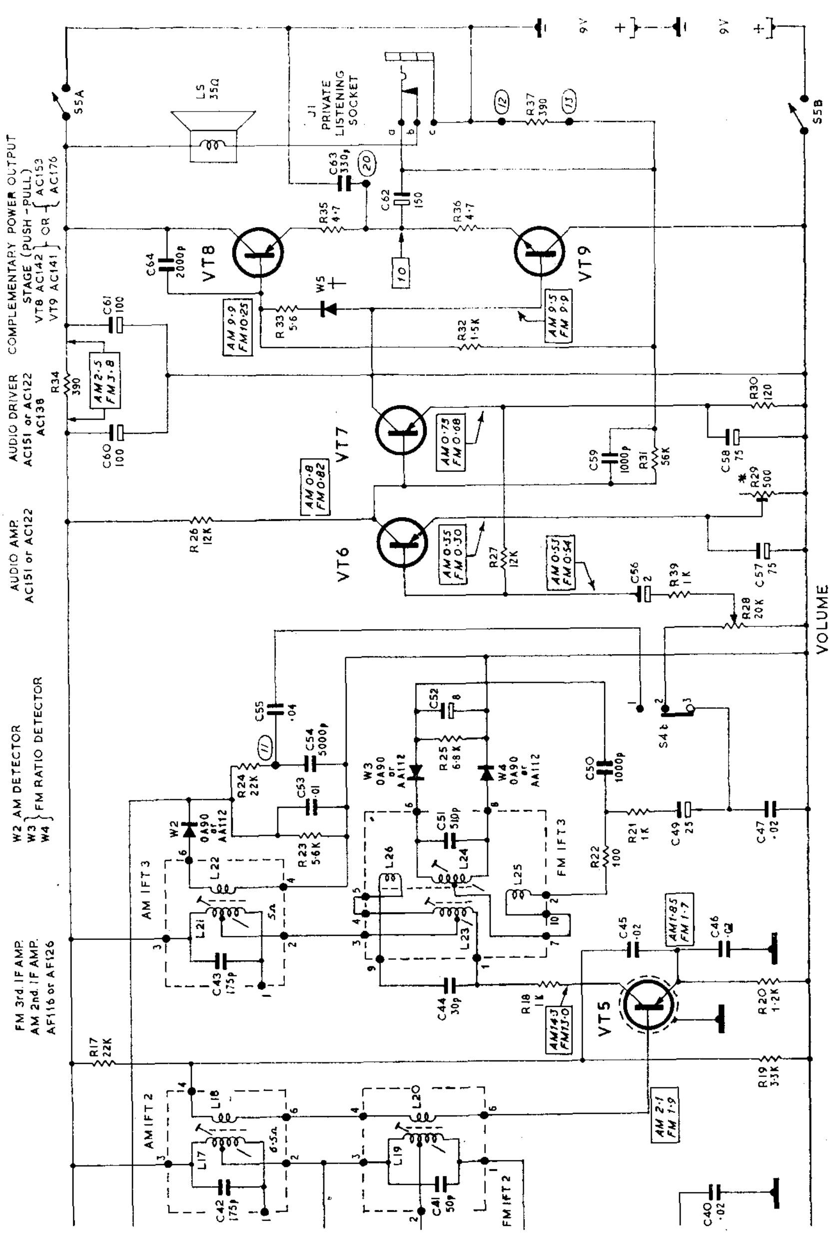
Tag Connections

1. To SKT1 "live" contact.
2. To telescopic aerial.
3. To L1.
4. To C17.
5. To L7.
6. To S4A contact 2.
7. To L7.
8. To S4A contact 5.
9. To S4A contact 4.
10. To frame of loudspeaker.
11. To C55.
12. To J1 contact "c", and C63.
13. To J1 contact "a".
14. To C20, C23 and S3a contact 1.
15. To C6 and upper connection of L2.
16. To C6 and lower connection of L2.
17. To C10 and upper connection of L4.
18. To C10 and lower connection of L4.
19. To C31 and S3A contact 4.
20. To C63.



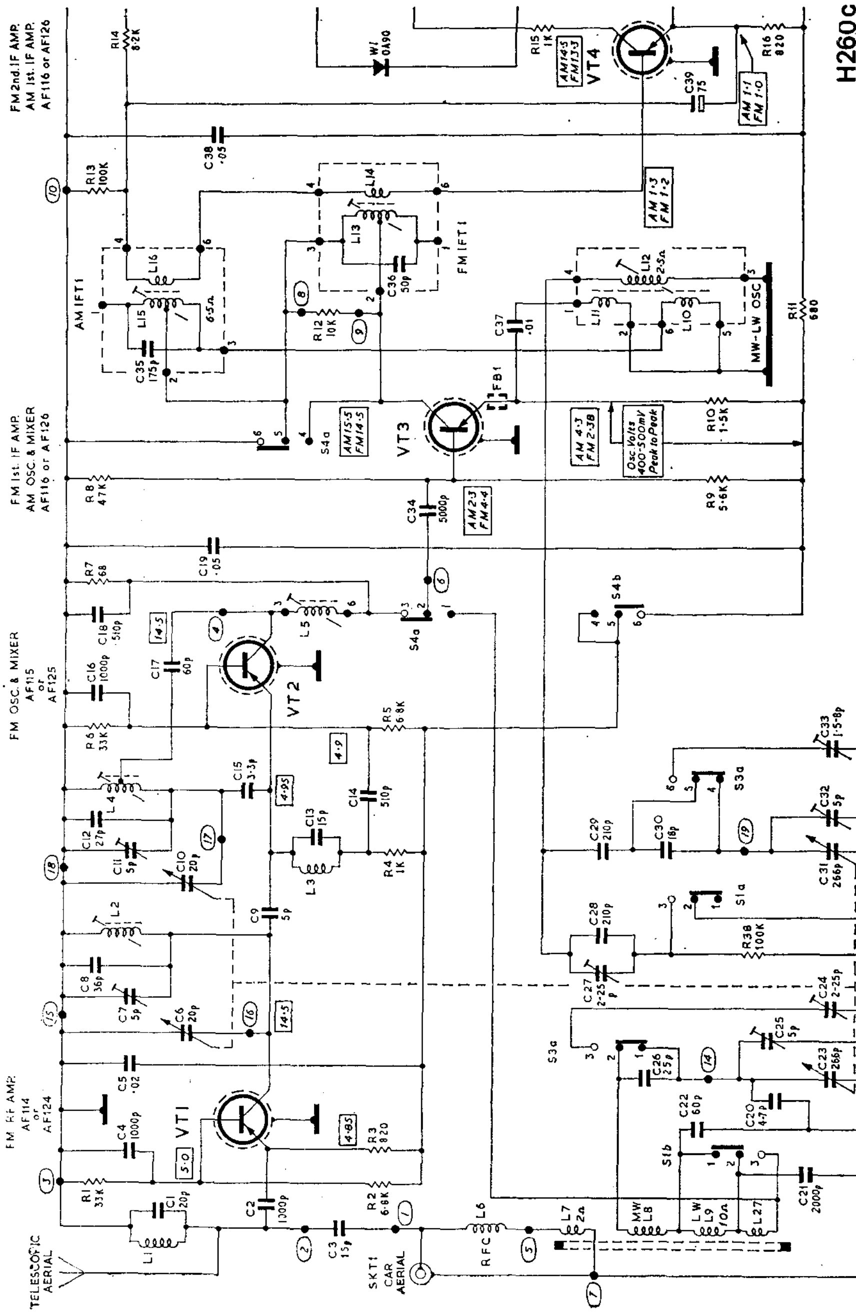
(H260a) Circuit Diagram Details—Model 6160

Circuit Diagram Notes: 1. D.C. resistance readings are shown against inductors where these are 0·5Ω or greater. 2. Ringed figures indicate printed board tag connection points.



H260b

(H260b) Circuit Diagram—Model 6160 (Part)



H260C

(H260c) Circuit Diagram—Model 6160 (Continued)

F.M. Operation: The signal is applied via the coupling capacitor C2 from the V.H.F./F.M. tuned circuit L1/C1. The collector of VT2 is loaded by L5 and tuned by C17. C17 also provides coupling into the oscillator tuned circuit (L4, C10, C11 and C12). C15 provides feedback into the emitter and L3 and C14 form a 10·7MHz F.M. I.F. rejector with C13 acting as an input phase corrector at oscillator frequencies. The 10·7MHz I.F. output developed across L5 is fed via S4A, contacts 2 and 3 and C34 to the base of VT3 which operates as an I.F. amplifier.

A.M. Operation: Medium and Long wave windings on the ferrite rod aerial are selected by switch S1B and coupled by C34 into the base of VT3 via S4A, contacts 1 and 2. VT3 operates as an A.M. oscillator and mixer and VT1 and VT2 are rendered inoperative when S4B disconnects their emitter and bias voltages from the battery positive rail.

Complementary Power Output Stage: P.N.P. and N.P.N. type transistors are used in conjunction with a stabilising diode to provide a transformerless power output stage giving an audio output of 600mW.

The audio signal developed across volume control R28 is applied via coupling capacitor C56 to the base of audio amplifier VT6. The amplified signal appearing at the collector of VT6 is directly coupled to the base of driver transistor VT7. The output from VT7 simultaneously drives the bases of both output transistors VT8 and VT9. During positive half-cycles of the signal, N.P.N. transistor (VT9) conducts, resulting in a fall in collector/emitter voltage of VT9. During negative half-cycles of the signal P.N.P. transistor (VT8) conducts, resulting in an increase in collector/emitter voltage of VT9. The loudspeaker is fed via C62.

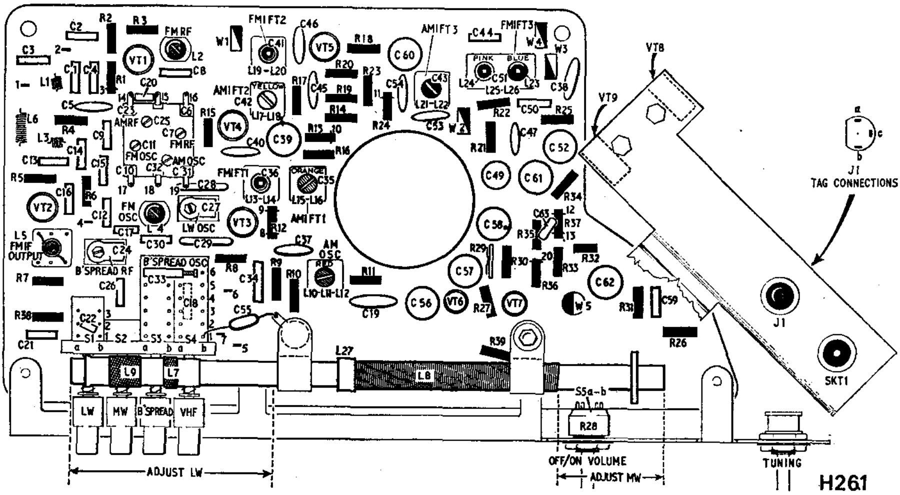
VT7 collector load R32 is returned to the "live" side of the loudspeaker and, as this point is coupled to the emitters of VT8 and VT9 through C62, the input signal to the output stage is virtually applied between base and emitter of both VT8 and VT9.

Diode W5 is biased by VT7 collector current and acts as a variable resistance which is sensitive to voltage and temperature variations. The resistance value of W5 is small compared with R32 and the voltage developed across W5 equals the sum of the nominal output transistor (VT8 and VT9) base/emitter voltages and so determines the correct quiescent operating conditions. During low ambient temperature conditions the resistance of W5 increases thus compensating for falling current of the output transistors. This effect also takes place in the event of falling battery voltage. The diode W5 also assists thermal stability at high temperatures and opposes high current drain from the battery.

Balance Adjustment: Output transistors VT8 and VT9 are series connected across the 18 V battery supply and to ensure a balanced supply voltage to each, an adjustment R29 is incorporated in the emitter circuit of VT6. Adjustment of this resistor sets emitter potential and hence collector potential of VT6. It will, therefore, determine the base potential of VT7 which is directly coupled to VT6. This bias decides collector potential of VT7 which in turn controls base voltages of VT8 and VT9. Correct balance is obtained when

potential of VT8/VT9 emitter junction is 10V with respect to positive line. The discrepancy from half-battery voltage (9V) is due to the emitter bias voltage developed across R30, which determines the limit of negative signal excursion before bottoming of VT7 takes place.

An alternative method of balancing operating voltages of VT8 and VT9 is by visual observation on an oscilloscope of output waveform at maximum output, when adjustment should be made for symmetry of both waveform and clipping at high outputs.



(H261) Component Locations—Model 6160

Heat Sink Components: Heat sink grease is applied to output transistors during production and it must always be reapplied by the engineer when replacing a transistor in its heat sink during servicing. Heat Sink Compound DP2623, or anti-tracking grease MS4, is suitable.

Alignment (General): Connect a 35 Ω output meter in place of loudspeaker, or a 20,000 ohm/volt meter set to a suitable A.C. range, across the internal loudspeaker terminals. With the volume control set to maximum, maintain audio output at 50mW throughout alignment, except where otherwise stated.

Alignment (A.M.I.F.): Select M.W. Inject 475kHz 30 per cent amplitude modulated signal, via 0·1 μF capacitor, across C23 (tags 14 and 15) the aerial section of the tuning gang. Tune L21/L22, L17/L18 and L15/L16 for maximum output. Repeat until no further improvement results.

Alignment (A.M.R.F.): Check that with the tuning gang fully closed the cursors coincide with the marker pips at the left-hand side of the L.W. and M.W. scales. M.W. must be aligned first. Inject A.M. signals (30 per cent amplitude modulated) via a loop loosely coupled to the ferrite rod aerial. Set cursor to 500 metres (600kHz), inject 600kHz signal and tune L12 and L8

(slide ring along ferrite rod) for maximum output. Set cursor to 200 metres (1500kHz), inject 1500kHz signal and adjust C32 and C25 for maximum output. Repeat as necessary to obtain correct calibration and maximum output. Select L.W. Set cursor to 1500 metres (200kHz), inject 200kHz signal and adjust C27 and L9 (slide coil along ferrite rod) for maximum output.

Luxembourg Bandspread. Switch to "Bandspread" and set cursor at 200 metres. Inject, via loop, 1500kHz signal and adjust C33 and C24 for maximum output.

Note: Always check bandspread aerial trimmer (C24) after altering C25 or the tuning ring to L8. Also after reboxing, check that Luxembourg is receivable on bandspread push-button range: if not readjust M.W. oscillator trimmer C32.

Alignment (F.M.I.F.): Select F.M. Inject 10·7MHz (25kHz deviation) via 0·1μF blocking capacitor to tag 6 on the printed circuit board. Peak L24, L23, L19, L13 and L5 for maximum output. Increase signal level by 6dB and reduce receiver volume control setting to maintain 50mW output. Switch signal generator to A.M. and tune L24 for minimum output (A.M. rejection). Switch signal generator to F.M. and check that F.M. output has not been reduced. Repeat above as necessary for maximum F.M. output and minimum A.M. output.

Note: L24 should be tuned to the outer peak, i.e. with the core protruding from the top of the can by approximately $\frac{1}{8}$ in. All other cores to be tuned to the inner peak.

Alignment (F.M.R.F.): Check that gang is fully closed. Unsolder lead from tag on telescopic aerial and connect the signal generator between this lead and "earth" line. Adjust tuning control to set cursor at 96MHz and inject 96MHz signal. Adjust C11 and C7 for maximum output. Set cursor to 88MHz and inject 88MHz signal. Adjust L4 and L2 for maximum output. Repeat as necessary to obtain correct alignment.

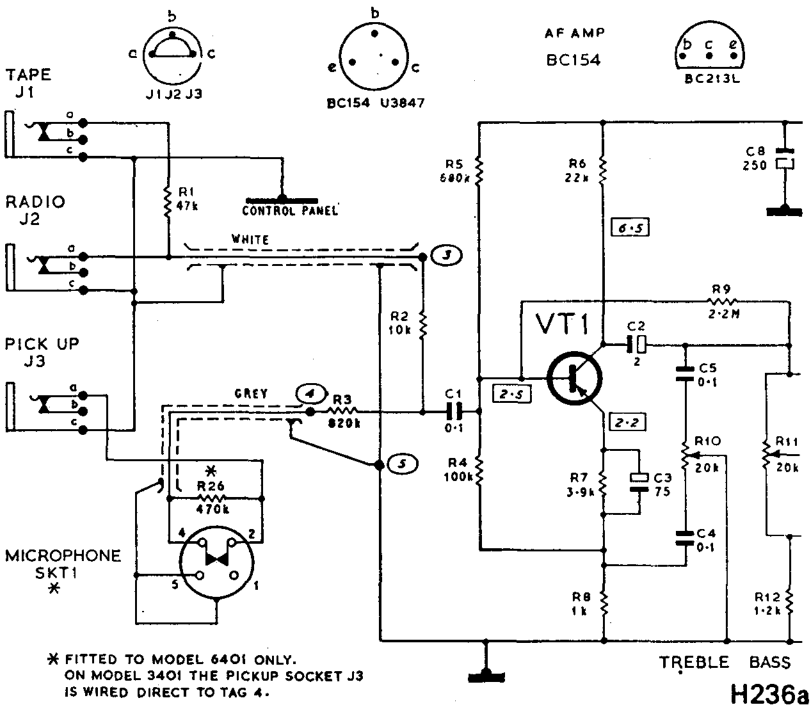
Note: While tuned to an R.F. signal check tuning of L5 for maximum output.

ULTRA — Model 6326

General Description: This model is electrically similar to the H.M.V. Model 2332, which is described on earlier pages in this volume.

ULTRA — Model 6401

General Description: Add-On stereo amplifier with an output power of 5W. Power consumption, 20W at 240V. Mains supply: 200–250V, 50Hz. Loudspeaker: elliptical, 8Ω.



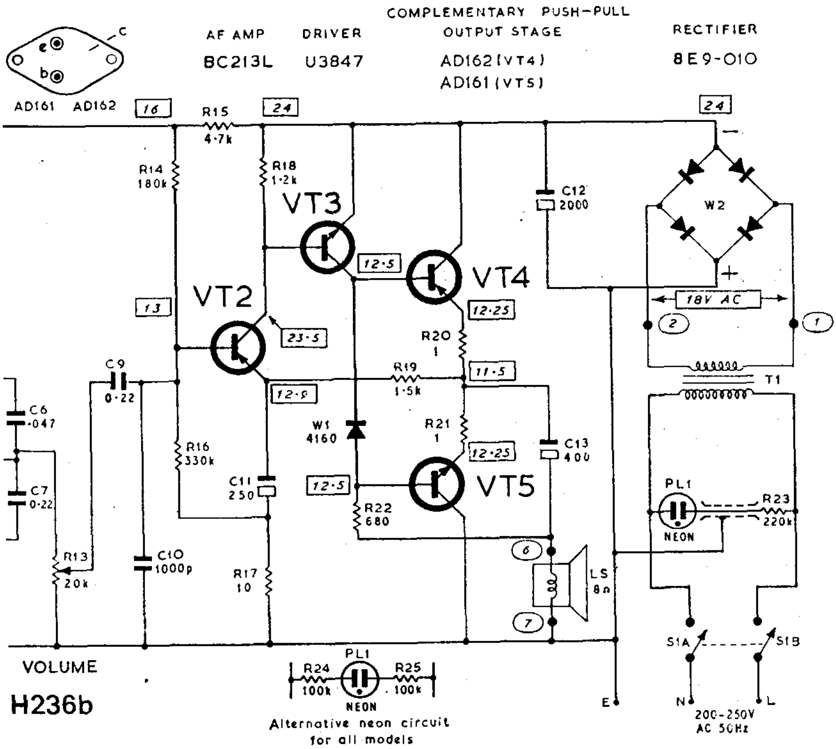
(H236a) Circuit Diagram—Model 6401 (Part)

Service Notes: The amplifier is suitable for the following applications:

1. A second channel amplifier for stereo reproduction in conjunction with mono record players which are fitted with stereo pick-ups.
2. A second channel feed for a stereo tape recorder when used in conjunction with a mono record player fitted with a stereo pick-up.
3. A tape recorder monitoring amplifier.
4. A boost amplifier for transistor radios and tape recorders.
5. A microphone amplifier for baby alarms, etc.

Connecting Lead: A 12 ft. screened lead is supplied, terminated at each end with a 3·5mm. jack plug, for connection to a transistor radio or record player.

Input Sockets: *Mic:* 4-pin DIN type switched socket. Input impedance 1M. *Tape:* 3·5mm. jack. To accept an input from the radio output socket of a tape recorder. The socket may also be used as an output socket (100K) to feed into a tape recorder. *Pick-up:* 3·5mm. jack. To accept input from a crystal or ceramic cartridge. *Radio:* 3·5mm. jack. For connection to tape or

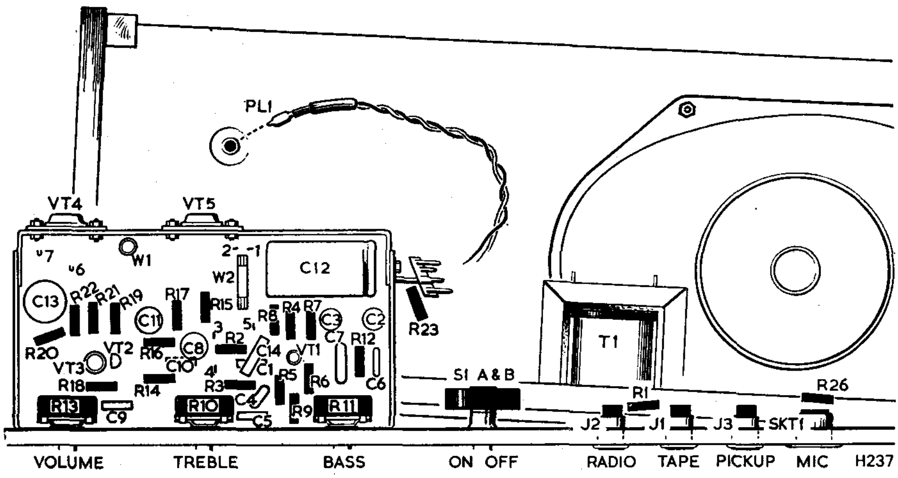


(H236b) Circuit Diagram—Model 6401 (Continued)

earphone socket of a transistor radio. A transistor radio without tape socket may be connected to the amplifier via the earphone socket, but in this case it may be necessary to connect a load resistor (33 Ω approx.) across the RADIO socket (J2).

Access for Service: Remove two metal and two plastic screws to release back cover, and open slot in cover to release mains lead. The plastic screws can be refitted by pushing them straight in. Note 'speaker lead colours then unplug them from tag panel and detach 'speaker frame earthing lead. Take out two plated screws securing the control escutcheon and chassis assembly and lift latter clear of cabinet within limit of leads. Note that the neon indicator may be unplugged from tag panel attached to side of chassis.

Circuit Diagram Notes: Figures in rectangles are voltage readings taken with a 20,000 ohm/volt meter (appropriately set to either 25 V or 5 V range) under quiescent conditions with 245 V mains input and measured between positive chassis line and points shown except where otherwise indicated. Ringed figures show printed board tag connecting points.



(H237) Component Locations—Ultra Model 6401

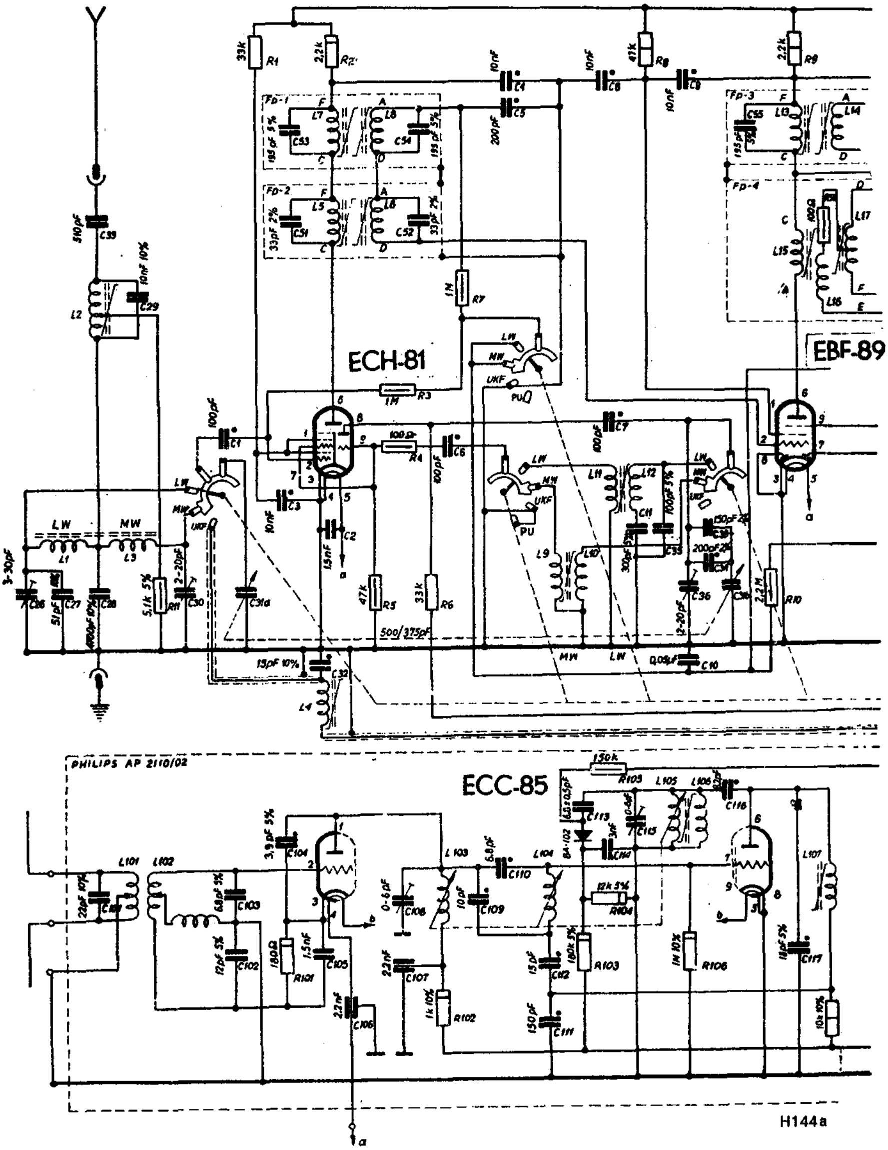
UNITRA — Model K-100

General Description: A.M./F.M. radio receiver with an apparent power output of 1 VA. Loudspeaker, 5 Ω. A.C. mains 110/120/220/240 V 50 c/s. Delay-action fuse 0·2 A.

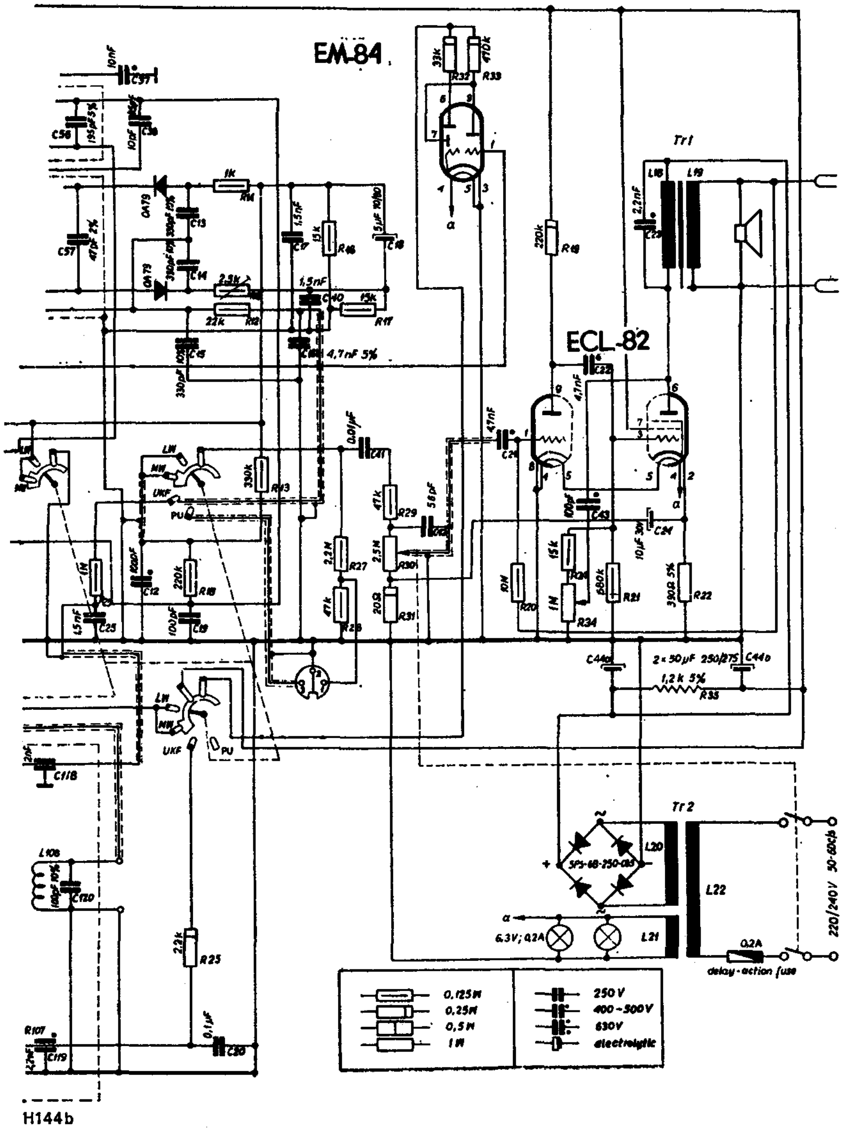
Wavebands: L.W.: 150–285 kc/s. M.W.: 525–1605 kc/s. V.H.F.: 87·5–108 Mc/s.

Alignment:

Tuning	*Wave switch*	*Dial indicator*	*Measuring frequency*	*Signal generator*	*Alignment*		
I.F.-transformers A.M.	M.W.	525 kc/s	465 kc/s	Through 30,000 pF to grid 1 ECH-81	L14, L13 L8, L7	Max.	
I.F.-eliminator M.W.	M.W.	525 kc/s	465 kc/s	Through 30,000 pF to aerial jack	L2	Min.	Align first the M.W. range
Long L.W.	L.W.	175 kc/s tune to signal	175 kc/s 270 kc/s		L11, L12 L1, C26	Max.	
Medium M.W.	M.W.	600 kc/s 1400 kc/s	600 kc/s 1400 kc/s		L9, L10, L3, C26, C30	Max.	
I.F.-transformers F.M.	F.M.		10·7 Mc/s F.M. dev. ±22·5 kc/s	To the screening cup on ECC85. The cup disconnected from earth	L15, L6 L5, L4 L107 L108	Max. Between 2 max.	Correct tuning only by oscilloscope
	F.M.	·	10·7 Mc/s mod. 400 c/s		L17	Min.	
F.M. tuner	F.M.	87·5 Mc/s 108 Mc/s 99 Mc/s	87·5 Mc/s 108 Mc/s 99 Mc/s	F.M. input jack	L115, L101 L102, L106 C108	Max. Max.	



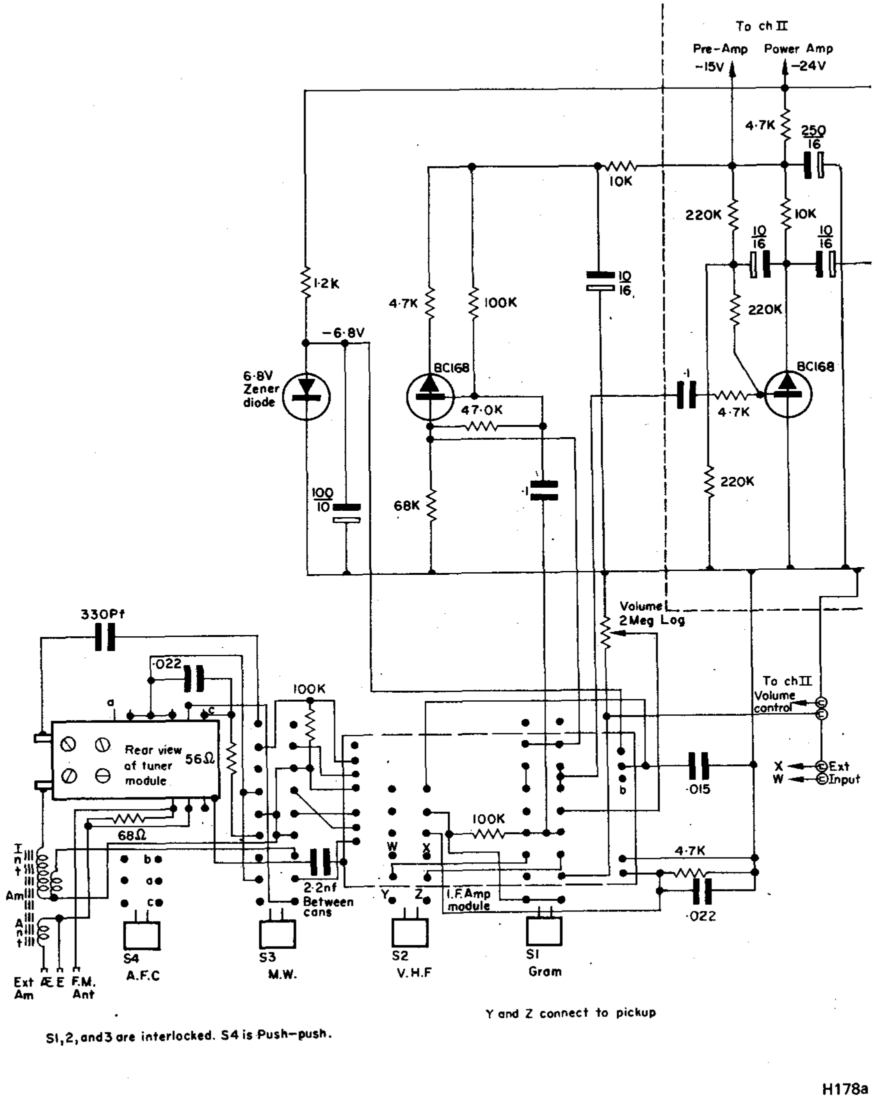
(H144a) Circuit Diagram—Model K-100 (Part)



(H144b) Circuit Diagram—Model K-100 (Continued)

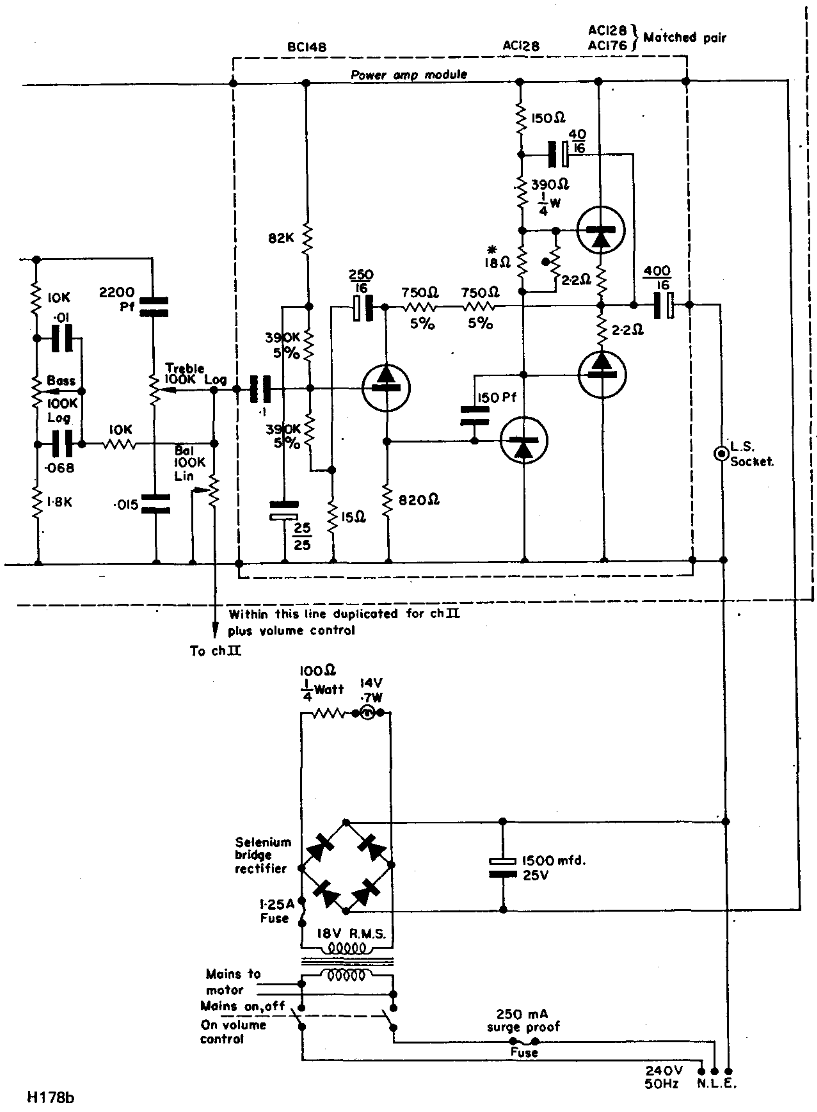
VAN DER MOLEN Mk I Radiogram

Provisional Information: Stereophonic radiogram—Mk I version.



(H178a) Circuit Diagram—Van der Molen Mk. I Stereophonic Radiogram (Part)

Note : Part of top right of H178a and all of top left H178b show the area of duplication for Channel II (plus volume control).



(H178b) Circuit Diagram—Van der Molen Mk I Stereophonic Radiogram (Continued)

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